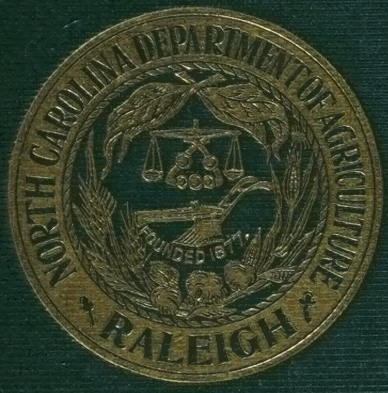
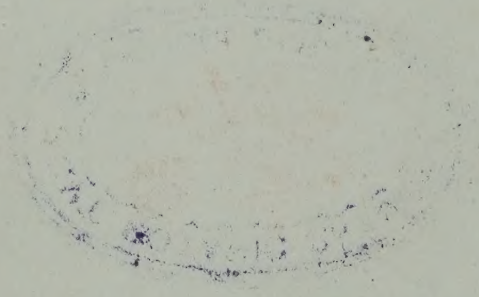
REPORT

COMMISSIONER OF AGRICULTURE



NORTH CAROLINA

1909



GOVERNMENT BOTANICAL GARDENS
LIBRARY.
Section.....
No.....

GOVT. BOTANIC GARDENS,
LAL BAGH, BANGALORE.
25/5/10

BIENNIAL REPORT

OF

WILLIAM A. GRAHAM,

COMMISSIONER OF AGRICULTURE,

RALEIGH, N. C., JANUARY 1, 1909.

RALEIGH:
E. M. UZZELL & CO., STATE PRINTERS AND BINDERS.
1909.

0
630
GRA

GOVERNMENT BOTANICAL GARDENS
LIBRARY.
Section.....
No.....

LETTER OF TRANSMITTAL.

RALEIGH, January 1, 1909.

To His Excellency, ROBERT B. GLENN, *Governor.*

SIR:—I have the honor to transmit herewith the report of the work of the Department of Agriculture, and respectfully ask that you have the same transmitted to the General Assembly.

Very respectfully,

W. A. GRAHAM,
Commissioner.

CONTENTS.

PAGE.

Adulterants 466
Appendix 178
Apple Crop, Handling the 61
Apple Culture in Mountain Regions 79

Bee-Keeping as an Occupation for Women 326
Breakfast Food 398
Budworm 498
Butter Making on Farm, Profitable 350

Canning and Pressing 151
Chinch Bugs 507
Ciders 412
Coloring Matters 426
Commercial Fertilizers, Analyses of 526
Co-operative Dairy Demonstration 341
Corn Bill-Beetle 501
Corn and Cotton, Test of 212
Corn, Insect Enemies of 491
Corn-root Webworm 501
Corn Stalk-borer 503
Cotton-seed Meal, Analyses of 563
Cotton-seed Meal, Inspection and Analyses of 467, 470
Country Woman's Spending Money 329
Cutworms 495

Dairying 338
Dairy Herd, Management of 348
Demonstration Work in Animal Husbandry 285
Demonstration Work as Applied to Farm Crops 281
Demonstration Railway Cars 306
Dewberry Field, Establishing a 132
Dewberries, Harvesting and Marketing 147
Dewberries, Preliminary Report 128

Farm Demonstration Work 280
Farm Institute Work, Report of 289
Feeding Stuff and Cotton-seed Meal, Sixth Report on 430
Fertilizers, Analyses of 521
Flour, Examination of 392
Food Adulteration for 1908, Report on 354
Food, A Talk on 317
Fruits, Canning and Preserving of 151
Fruits, Description of Varieties 109
Fruits, Varieties for Growing in North Carolina 102

Gloomy Scale, The 520

PAGE.

Lectures Delivered at Women's Institutes 313
Lettuce-Growing in North Carolina 180
Liquors, Distilled 420
Live-stock Farming, Relation to Soil Fertility 345

Microscopic Examination of Feeds 460
Milk and Cream, Marketing 351
Mother, Source of Inspiration to Child 331

Orchard Demonstrations 283
Orchard Demonstration Institutes 309

Phosphates 402
Preservatives 428

Spraying Demonstrations 284
Starches Used in Cotton Mills, and Their Adulterations 472
State Dairymen's Association 340
State Farmers' Convention 321
Sweeteners, Artificial 426

Tables on Adulterated Food 364
Tables Showing Results of Variety Tests of Corn and Cotton 216
Test Farms, Report of Work on 212
Tonics 426

Vegetables, Canning and Preserving 151

Women's Institutes, Report of 299
Women's Institutes, Work it May Do 333
Women's Branch of Farmers' Institute 323
Wireworms 493

GOVERNMENT BOTANICAL GARDENS
LIBRARY.

BIENNIAL REPORT OF THE COMMISSIONER OF AGRICULTURE, 1907-1908.

To His Excellency, GOVERNOR R. B. GLENN.

SIR:—In compliance with subsection 14, section 3944, of the Revisal of 1905, I submit to you for transmission to the General Assembly the following report of the Department of Agriculture for the years 1907 and 1908.

Hon. Samuel L. Patterson, of Caldwell County, who had filled the office of Commissioner of Agriculture, by virtue of election, since 1900, and six years at other periods prior thereto, died September 14th of this year. His administration of the office, when advances made in rendering it efficient and beneficial in practical matters are considered, makes it notably the most useful in the history of the Department. Its present condition is a fitting memorial of his useful life and his high standard of devotion to and honest performance of public duty with the scrupulous honesty he would give to personal matters.

On February 16, 1908, Mr. T. K. Bruner, who had held the position of Secretary to the Board for twenty years, died. He possessed more different qualifications for the various lines of work required by the Department than any man in the State, and contributed much to its advancement.

WORK OF THE DEPARTMENT.

The work of the Department for the past two years has been conducted in accordance with the laws of the State and regulations adopted by the Board of Agriculture by authority of law concerning various matters under its supervision.

As receipts have increased, operations of the Department have been expanded so as to undertake work along new lines or to extend along those already under consideration.

When the Department was reorganized, in 1899, there was only one officer whose duties related to insect work, whether animal or vegetable pests. He was the Veterinarian, and was expected to advise in all matters relating to insects. Now there are two in the Veterinary Division, three in the Division of Entomology (tree or vegetable diseases or pests), two in the Division of Horticulture. The increase in the number of analyses of fertilizers, pure food, stock feeds and other work in the Chemical Division has required an addition of four assistants, or 100 per cent of the force of 1899, and this force will still have to be increased as the work increases. The divisions of co-operative experiments, immigration, and monthly reports of the sales of leaf tobacco by the warehouses of the State are new features now conducted.

The propagation of fish has been undertaken by the National Government to such an extent as to render work as to migratory fish unnecessary by the Department. But the building of stone dams across the rivers in the piedmont section, in many cases, notably the Catawba and Yadkin rivers, has practically destroyed the inland movement of these fish. The Department will endeavor to have investigations made as to practicability of restocking streams with varieties of local kinds of native fish.

The rapid spread of the "stock law" over the State has rendered unnecessary any action by the Board as to fences, as this is now largely local. A map showing the stock law, no-stock law, quarantine and free territories in the State has recently been issued.

The Department is to a considerable extent a sublegislature. The Legislature, in committing to its execution specified laws, confers upon the Board of Agriculture power to make regulations for this purpose, which are given the authority of law, and violations of them are made misdemeanors cognizant by the courts. The power to confer this authority has been tested in the courts and approved by decision of the Supreme Court. The wisdom of this action is apparent to any one giving the subject consideration. If the details were enacted by the Legislature they could be changed only by the same authority, and would have to remain as enacted for at least two years, no matter how impracticable any of them might be found in execution, while under the present conditions the Board at each session has full authority to alter existing regulations so as to answer the conditions required.

No body of the State's officers has more important duties to perform nor does more efficient work in the same length of time.

DRAINAGE.

The National Department of Agriculture is now doing some work along this line, with which the State Department will co-operate.

PUBLIC ROADS.

By omission of the "Alexander law" from the Revisal of 1905 the Department has no authority in road matters, except as a matter in which agriculture is deeply interested. It may be interesting to state that the general road law of the State, under which many of the counties are acting, is the same as adopted in 1788, in the early days of the State Government. The inhabitants of such counties are almost literally going "in the way their fathers trod." No subject is of more importance to the farmers of the State, and attention will be given to the "mud tax," which is the heaviest and most unnecessary tax that the farmer pays.

ORGANIZATION OF THE DEPARTMENT.

The following are the divisions under which the Department has been operated during the time of this report, and attention is asked to the annexed report of the superintendents for further information concerning the work of each:

1. *Immigration*—Elias Carr.
2. *Division of Chemistry*—B. W. Kilgore, State Chemist.
3. *Veterinary Division*—Tait Butler, Veterinarian.
4. *Entomological Division*—Franklin Sherman, Jr., Entomologist.
5. *Horticultural Division*—W. N. Hutt, Horticulturist.
6. *Co-operative Experiments*—T. B. Parker, Demonstrator.
7. *Museum*—H. H. Brimley, Curator.

CHEMICAL DIVISION.

The Chemical Division is under the supervision of Dr. Kilgore, and covers the analyses of fertilizers, rocks, minerals, soils, water, etc., and operation of the laws concerning pure food, stock and condimental feeds, etc. Careful attention is invited to his report as to work done.

Mr. B. W. Kilgore also superintends experiments at the test farms.

SOIL SURVEY AND TEST FARMS AND FARM DEMONSTRATION WORK.

This is conducted, like the cattle quarantine, in conjunction with the United States Agricultural Department, the expenses being defrayed by each department. The object is to locate the different types of soil in the State. Upon these types it is desired to locate test farms for practical and scientific purposes. Test farms have been established in Edgecombe County; at Willard Station, in Pender County; Statesville; Blantyre, in Transylvania County; near Swannanoa, in Buncombe County; and arrangements are on foot for a peanut, bright tobacco and grass and stock farm. The effort is to work these farms for the benefit of the crops grown in each section, first on small plats and then on a large scale, showing results of different kinds and amounts of home-made and commercial fertilizers, preparation of land, cultivation and rotation of crops and demonstration work.

As it might be supposed that all children of the same parents would be exactly alike, so it might be inferred that all soils composed from decomposition of the same rocks would be identical; but this is known to be true in neither case.

By demonstration work on different fields in the same locality or type of soil the variations can be ascertained and the manures prepared and cultivation suitable to each learned.

The Demonstrator of the Department, as requested or opportunity offers, can visit localities of the State, make suggestions upon these lines and gather statistics for promotion of the work. This bureau of the work is under the direction of Mr. T. B. Parker, of Wayne County, a successful, practical farmer. The National Department is doing a large amount of work along this line, and there is hearty co-operation between the two departments.

The object of the Department is, as far as practicable, to have farmers test upon their lands the theories advanced by science, and to realize benefits by ascertaining the particular needs of their respective fields. The loss to the farmer in buying ingredients not needed in fertilizers, and the failure to purchase what is actually needed, amounts to millions of dollars annually. To educate them along these lines is the object of test-farm and demonstration work.

THE CORN CROP.

The corn crop is the most important to the North Carolina farmer, and special attention is given to it in this work. Few men who buy corn find farming profitable. A man "out of corn" is generally out of everything else essential in farming; one with corn to sell is generally independent. We wish to see every farmer raise his supply of corn, and this will certainly lead to production of other necessaries.

Selling cotton gives the farmer more trouble and anxiety, and frequently more actual loss, than any other business connected with the farm. Farmers with a full supply of corn are generally able to act independently as to sale of cotton; and there is no more potent factor in the sale of cotton than a good supply of corn.

IMMIGRATION.

The United States laws forbid the introduction of laborers under contract or agreement. The State limits efforts to obtain immigrants to desirable persons from other States of the Union, Canada and other nations of Teutonic, Celtic

or Saxon origin. But the following counties are exempted from this provision and are allowed to secure immigrants from any country except southern Italy: Brunswick, Bladen, Columbus, New Hanover, Onslow, Pender, Pasquotank, Surry, Dare, Hyde, Martin, Washington, Tyrrell, Pamlico, Beaufort, Lenoir, Carteret, Craven, Pitt, Montgomery, Camden, Currituck and Duplin.

The work done by the Department has been more successful than ever before. Literature in English and several foreign languages, setting forth the special advantages of North Carolina to home-seekers, has been published and distributed. Lantern slides have been made and much material collected for making illustrative exhibits. Agents have been appointed in England and Scotland and efforts have been made to secure only a desirable class of immigrants.

Owing to the general financial panic, active work in foreign countries has been stopped. However, we have received into the State seventy-five immigrants from Great Britain, twelve from Norway, two from northern Italy, and from other States thirteen families, most of whom have purchased farms. Many others have come, but we have no way of finding out at what point they have located. Private parties and corporations, notably the Carolina Trucking Development Company, of Wilmington, N. C., who have located 833 persons in the vicinity of Wilmington, have done much to induce immigration, and the Department co-operates with them in every way possible.

As required by law, lists of lands for sale have been prepared and, together with other descriptive literature, are distributed by the Department. Lists of parties inquiring through the Department for North Carolina property, with a view of purchasing, are also given to the State papers for publication.

The Department has no lands of the State for sale, and can make no contracts, warrant no titles nor do any work of like nature. It can only put parties desiring to purchase property in the State in communication with citizens who have property to sell, and leave them to perfect sales, if it is found desirable.

The lists of lands are divided into four pamphlets—Tidewater, Coastal Plain, Piedmont, and Mountain—each containing the lands recorded for sale in the respective divisions.

VETERINARY DIVISION.

The Division of Veterinary Science is under the direction of Dr. Tait Butler, whose services are devoted to giving information as to the care and feeding of farm animals, improvement of live stock, treatment of diseases, and the gradual extermination of the tick, which is the source of the deadly Texas or splenic fever. Dr. Butler is also Director of Farmers' Institutes, and that work has increased in value and interest under his management.

CATTLE QUARANTINE AND ERADICATION OF THE FEVER TICK.

The United States and State laws concerning the eradication of the cattle tick are simply improvements on the act of the Legislature of 1795, concerning the driving of cattle from the oak to the long-leaf pine section of the State, which was continued as a statute until the Revisal of 1905. The disease was called "murrain," or distemper, and its malignity known, but not for a century was the cause ascertained and direct effort made for care and eradication.

Starting in 1899 with the crest of the Blue Ridge as the location of the quarantine line, it has been moved east to the Roanoke River, in Warren County,

as the northern boundary, and to the Pee Dee, in Anson, as the southern boundary of the State. This quarantine line is established by the United States Agricultural Department. The movement of cattle is restricted to a few months each year and subject to inspection and regulations, while exempted territory is free from impediments. The price of cattle in the exempted section (that which is free from the tick) is thought to be one cent per pound, live weight, over that in the quarantined sections. The value of exemption is apparent. The stock law tends to destroy the tick; where it has prevailed for several years, few ticks being found, the county is soon declared free.

At the suggestion of this Department, infected counties or parts of counties have been quarantined and the clear territory has been given the benefit of exemption.

Dr. Kiernan, of the United States Agricultural Department, has directed the work, in conjunction with Dr. Butler. The United States Department has employed thirteen inspectors and the State four. We anticipate some co-operation next year, and it is expected to continue the work on the same scale.

FARMERS' INSTITUTES.

Meetings of farmers to hear matters pertaining to their vocation discussed by scientific men and also by practical farmers have met with great encouragement in the numbers attending and the interest shown in the proceedings and the beneficial results to farming in the communities where the institutes are held.

Realizing that while "A good farmer without, it is needful there be," "A good housewife within is as needful as he," institutes for the benefit of the farmers' wives and daughters were introduced two years ago. They were well attended and will be helpful to the ladies of the farmers' families.

There were 234 institutes held this year (1908), attended by 21,000 persons.

Demonstration work has been added to the institute work. A demonstrator endeavors to assist in carrying into effect on the farm what is said at the institute. Good seeds are distributed and practical assistance given in the improvement of the land, cultivation and harvesting of the crops, selection of seed and improvement of crops and other matters pertaining to the farm.

Premiums are offered at fairs in different sections of the State, for men, women and boys, in the departments of farm work.

ENTOMOLOGY.

The work of this division includes the inspection of fruit trees, which are not allowed to be sold in this State unless declared free from disease. Experts are sent to examine all nurseries for insect pests, and many commercial orchards are inspected. Directions are furnished for preparation of material for spraying and for its application. The San José Scale is being controlled in many places and further damage prevented by directions sent from this office. Other insect pests and diseases have been prevented or cured, and much valuable information given the people of the State on matters pertaining to insects of all kinds. This division is under the direction of Mr. Franklin Sherman, Jr., a thorough and enthusiastic worker.

HORTICULTURE.

Mr. W. N. Hutt supervises this division. Its work is devoted to promoting the interests of trucking, the home and market garden, also the culture, preservation and marketing the fruits of the State.

The test farm in Pender County is used in connection with the trucking interests of the eastern part of the State. On this farm $1,500 was realized from the sale of the lettuce raised on one and one-fourth acres of land.

The Blantyre farm, in Transylvania County, and the Greenwood farm, in Buncombe County, will be used largely to illustrate the culture, harvesting and marketing of fruit and the prevention and cure of diseases of fruit trees.

Mr. Hutt has recently held in the apple section a short series of institutes to illustrate the proper packing of fruit for shipment. Institutes on pruning, spraying, etc., were held in proper season.

SALES OF LEAF TOBACCO.

Chapter 97, Laws 1907, requires the Department to preserve a record of the leaf tobacco sold on the floors of the warhouses of the State and publish them monthly. Each warehouse is required to furnish an account of its sales, and is guilty of a misdemeanor for failure.

THE BULLETIN.

The Bulletin is issued monthly, each month being devoted to a particular subject. Its value seems to be appreciated, both within and without the State, as is attested by its continually increasing mailing list, which is now nearly 35,000, an increase of 8,000 in four years. Besides the regular monthly Bulletin, special papers are issued when deemed of enough importance to justify the expense.

THE MUSEUM.

The State Geologist has, since the establishment of his department, in 1850, collected specimens of different kinds, principally of minerals, representing the natural resources of the State. In 1879 the care of the Museum and expense of maintenance were transferred to the Department of Agriculture. A building has been erected for its occupancy and its contents increased manifold. It is now by far the most extensive in its contents of anything of its nature south of Philadelphia, save the National Museum at Washington, D. C. To it, more than any other source, is attributable the fine displays the State has made at international, national and State expositions. It is the State's object-lesson, representing its resources in agriculture, timber, minerals, fishes, birds, game, animals and other *flora* and *fauna*.

It is under the efficient management of Mr. H. H. Brimley, as Curator, who has ably filled the position for thirteen years and added much in value and number to the contents.

As articles affected by time become undesirable they are replaced.

HALL OF HISTORY.

The Hall of History, so important a feature of the great State Museum, was begun in 1903, and in the time which has intervened a collection of objects illustrating every period of the life of North Carolina, as province, colony and State, has been so rapid that the number of objects considerably exceeds 5,000. The collection is particularly rich in objects of the Colonial and Revolutionary periods and that of the Civil War. The director has made several journeys in the State, all resulting in marked additions to the collection. The gifts, in the way of paintings, photographs, etc., already exceed $1,500 in value. Many lec-

tures have been delivered each year in the Hall of History, and this object-lesson, the finest in the South, has proved a great stimulus to historical research and popular interest in the history of North Carolina. The collection has been made by and is in charge of Col. F. A. Olds, as director, and the objects therein are either gifts or loans. Any persons having possession of or knowing of the location of objects which have a bearing upon North Carolina history in any way are particularly requested to inform the director of this fact, as objects are thoroughly protected against injury by moths or other insects and are set before the public in the most attractive way.

THE DEBT FOR THE AGRICULTURAL BUILDING AT THE A. AND M. COLLEGE.

The interest on this debt and $20,000 of the principal have been paid during these two years. The balance due on account of it is $30,000. In order to prosecute the proper work of the Department, it has been necessary to carry this debt. It is expected to cancel it during the succeeding two years.

VACANCIES IN THE BOARD.

The time of the following members of the Board of Agriculture expires March 9, 1909: Messrs. C. W. Mitchell, of the Second District, and R. W. Scott, of the Fifth District. Mr. R. L. Doughton, of the Eighth District, whose term would have expired at the same time, has resigned, having been elected to the State Senate.

Mr. W. J. Shuford, of Catawba County, has been appointed to the vacancy in the Ninth District caused by the resignation of W. A. Graham, appointed Commissioner. This term expires March 9, 1911.

LEGISLATION REQUESTED.

The attention of your Excellency is asked to the following desired legislation, and your approval thereof requested:

1. Authority to borrow not exceeding $100,000, to be used in erecting a new building and in making fireproof the newly erected part of the present structure, the money to be replaced in a series of years from the receipts of the Agricultural Department. The Department would appreciate it if the State would erect this building, as it is still carrying a debt of some thousands on the Agricultural building at the A. and M. College. It has developed the best department of its nature in the Southern States, and for promotion of its work a properly arranged building is very desirable, apart from the condition of the old, condemned structure, concerning which we submit the following: The present structure was built seventy or more years ago as a hotel. The foundation is not laid in lime mortar. Some of the sills rotted, and those which replaced them are not properly located. The east wall is out of plumb. The house was condemned and closed before the war. During the war it was used as offices for the Adjutant-General's Department of the State and a Confederate quartermaster. After the war it was again opened as a hotel, but was condemned and closed, and, as a condemned building, was bought by the Department of Agriculture. The foundation is insufficient, and, if sufficient, the building cannot be changed to such condition as is desirable for the work of the Department.

2. Placing the crop-pest work under the Department and abolishing the commission. The work of the crop pest was in effect transmitted to this Depart-

ment by subsection 4, section 3944 of the Revisal. This was enacted in 1899, while the crop-pest act was enacted two years prior—1897. The Department pays all the expenses of the work, which is practically done by the Entomologist.

3. A uniform law to regulate the registration, sale, inspection and adulteration of concentrated commercial feeding stuffs. This act has been approved by all the departments of the Association of Commissioners of the Southern States. Its enactment will make a uniform law, subject to State authority, and not an interstate or national law. A copy is submitted with this.

4. A uniform law to regulate the registration, sale, inspection and adulteration of condimental, patented, proprietary, trade-mark, stock or poultry food or feeds, condition powders and stock medicines or remedies.

5. An act to amend the Pure Food Law and make it more effective. It is also asked that half the cost of the pure-food work be paid from the State Treasury. No revenue is received from it, but the cost is paid from receipts from other sources, and the farmers should not pay total expenses.

6. An act to make it a misdemeanor to interfere with any officer of the Department in the execution of his duties in accordance with the law or any regulations of the Department made in accordance with the law.

7. That the execution of the immigration law be permissive and not mandatory, and that the law be so amended that, the Department having expended $100, an equal amount be available from the general funds of the State Treasury, and so for each additional $100 paid by the Department. As the act now stands, the Department must expend $5,000 before the State pays anything. Such was not the intention of those who favored aid by the State.

Bills covering these matters will be prepared and submitted to the Legislature.

Respectfully submitted,

W. A. GRAHAM,
Commissioner.

REPORT OF STATE CHEMIST.

MAJOR W. A. GRAHAM, December 1, 1908.

Commissioner of Agriculture.

DEAR SIR:—I beg to submit to you a report of the work of the Chemical Division of this Department for the past two years (December 1, 1906, to December 1, 1908).

The report will be made under the following heads:

1. Analytical Work.
2. Pure Food Work.
3. Concentrated Stock Feeds.
4. Test Farms.
5. Soil Work.

1. ANALYTICAL WORK.

The amount and kind of analytical work performed in the laboratory is shown in the following summary of analyses made in that time:

Official Samples of Fertilizers	1,396
Fertilizers and Fertilizer Materials for Farmers	281
Cotton-seed Meal	304
Waters	233
Marls, Lime and Lime Rock	68
Rocks, Ores and Minerals identified and values reported	322
Iron Ores	2
Meats	147
Fish and Oysters	12
Mince-meats	9
Catsup and Sauces	13
Canned Soups	4
Condensed Milks	16
Baking Powders	14
Preserves and Marmalades	44
Jams	17
Jellies	62
Fruit Butters	6
Maraschino Cherries	12
Ciders and Imitation Ciders	77
Fruit Juices and Imitation Fruit Juices	5
Pickles	6
Phosphates	10
Vinegar	103
Coffee	6
Soda Waters	198
Coloring Matter for Food Products	19
Chemical Preservatives	35
Butters	10
Oils, Table and Cooking	6

Canned Vegetables	21
Canned Fruit	16
Candies	42
Rice	59
Meal, Corn	20
Flour	68
Breakfast Foods	19
Artificial Sweeteners	5
Malts	5
Tonics	7
Wines	2
Beers and Imitation Beers	136
Distilled Liquors	36
Miscellaneous	21
Concentrated Stock Feeds examined chemically and microscopically	1,233
Soils	278
Experiment Farm Samples	521
Total for the two years	5,926

The kinds of materials and number of samples which the Department has been called upon to examine or found it necessary to analyze in the prosecution of its various lines of work have grown from year to year. The bulk of this work has been done in connection with the inspection and supervision of the trade in fertilizers, human foods and stock feeds, though a considerable amount of work has been done for farmers and citizens generally in the examination of minerals and ores, health and mineral waters, marls, soils, etc. Investigations on the test farms, conducted with the view of improving the quality and yield of corn and cotton, of increasing the amount of oil in the cotton seed, of determining the fertilizing value of the different varieties of the cowpea and of the different parts of the pea, have necessitated quite a large amount of careful detail analytical work. The analyses of fertilizers, human foods and stock feeds have been published in the Bulletin from time to time, while the reports on such miscellaneous work as rocks and ores, waters, marls, etc., have been made direct to the parties interested on the completion of the analyses.

The work on farm products is being used from time to time in publications giving the results of experiments on the test farms.

A large number of analyses of soils obtained in the preparation of soil maps of various counties have been made, and we plan to use these in connection with the preparation of a report on the soils and general agriculture of the several counties from time to time, including in these reports the soil maps of the counties.

In view of the wide distribution which has been made or will be made of the various results of analyses in the several lines of our work in the Bulletin, it is hardly necessary to go into detail regarding them in this report.

2. Pure Food Work.

The Food Law forbids the manufacture or sale of adulterated or misbranded food or beverage, and charges the Department of Agriculture with its enforcement.

The food work, so far, has been more educational than otherwise, the object being to show the dealers the requirements of the law and to expose adulterated brands of food by publicity. When the grocerymen and the public know that a brand of food is adulterated, if the manufacturer does not very quickly correct the wrong, the product is driven from the market. When the fact that a brand of food is adulterated is reported by the Department its competitors seize the report and use it with the grocerymen to show them that the product is adulterated. As the manufacturers know this, and as competition is close, they dislike to see their adulterated goods exposed.

Inspections are made throughout the State and samples of all food and beverages are collected for analyses. For the past year special attention has been given to inspection. The inspector tries to see the manager of every business and give him what help he can that will aid him in complying with the requirements of the law. As there are about 9,000 dealers in food and beverages in the State, the inspection is no small task, especially as many of the dealers have to have the law and rulings explained to them.

During the past two years (1907-1908) 1,290 samples of food and beverages have been examined for adulteration, and the results of the examination, with the names and addresses of the manufacturers and local dealers, have been published in the Department Bulletins for December, 1907-1908.

A summary of the work is given below, showing in detail the products that have been examined and the per cent of adulteration found:

SUMMARY OF THE RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1907 AND 1908.

Name of Samples.	*Number of Samples.*	*Per Cent of Samples Adulterated.*
Meats	147	7.48
Fish and Oysters	12	16.66
Mince-meats	9	22.22
Catsup and Sauces	15	30.76
Canned Soups	4	....
Condensed Milk	16	....
Baking Powders	14	....
Preserves and Marmalades	44	31.81
Jams	17	23.53
Jellies	62	38.71
Fruit Butters	6	100.00
Maraschino Cherries	12	100.00
Ciders and Imitation Ciders	77	53.39
Fruit Juices and Imitation Fruit Juices	5	40.00
Pickles	6	66.66
Vinegar	103	21.36
Coffee	6	33.33
Phosphates	10	70.00
Soda Waters	198	56.56
Coloring Matter for Food Products	19	....
Preservatives, Chemical, for Food	35	....
Butters	10	20.00
Oils, Table and Cooking	6	....

Name of Samples.	*Number of Samples.*	*Per Cent of Samples Adulterated.*
Canned Vegetables	21	....
Canned Fruit	16	....
Candies	42	....
Rice	59	....
Meal, Corn	20	....
Flour	68	....
Breakfast Foods	19	....
Artificial Sweeteners	5	....
Malts	5	20.00
Tonics	7	....
Wines	2	....
Beers and Imitation Beers	136	5.15
Distilled Liquors	36	11.11
Miscellaneous	21	18.20
Total for two years	1,290	

In food there are two classes of adulterants:

1. Those which are deleterious to health and render food unfit for use, and
2. Those which tend to lower its quality or reduce its value.

As the proposition of food adulteration is so immense, and as it has been impossible, with the funds available for that purpose, to do justice to the whole subject, it has been thought best to give attention, first, to that class of adulteration that is detrimental or injurious to health. So, the greatest effort, so far, has been to prevent the use in food of chemical preservatives and poisonous coal-tar dyes. For that reason, more attention has been given to that class of food in which deleterious adulterants have been more largely used.

During the year 1906 a careful examination made of the meats sold in the State revealed the fact that 47.6 per cent of them were adulterated with chemical preservatives, such as boric acid, salicylic acid and sulphites, the use of which in foods is a violation of the State Food Law. The meat men of the State were at once informed that the use of chemical preservatives in food products was in violation of the law, and that they must not be used in North Carolina. They were also informed that these preservatives were not sold under their chemical names, but under trade or proprietary names, though they, without an exception, depend upon the well-known chemical antiseptics for their preserving power.

During the summer of 1907 another inspection was made of the meats, when 134 samples were examined and only 7.5 per cent were found to be adulterated. During this year (1908) another examination was made, and chemical preservatives were found in only one sample, and that was sold by a dealer who was not in the business the year before.

An examination of the rice sold in the State reveals the fact that practically all of it is coated with glucose and talc. The coating material is used in very minute quantity, and the manufacturers claim that the coating is to protect the rice against insects. It, however, very much improves the appearance of the rice, and is therefore deceptive and illegal, unless the fact is stated on the label.

The subject of bottled soda waters and specialty summer drinks has been given a good deal of attention during the past season. There has probably been more deception practiced in the handling of this class of goods than any other one product. A large number of samples were examined, and 55 per cent of them were found to be adulterated. Upon a whole, they contain but little that is actually injurious to health, and less that is conducive to health. They were found to be grossly misrepresented, often branded pure fruit products, when they were entirely imitation and contained no fruit at all. They are often bottled under dirty and unsanitary conditions, and unless good attention is given them they may be the source of much sickness and disease, as well as a great deal of deception.

Without an exception, where samples of a class of food have been examined twice or more in different years, there is a general and marked reduction in the adulteration found. Adulteration in food, like most other frauds, cannot stand publicity long.

Mr. W. M. Allen, in charge of food work, gives all of his time to this phase of the Department's work.

3. Concentrated Stock Feeds.

The law governing the manufacture and sale of these products went into effect July 1, 1903. Since that time we have collected and analyzed, chemically and microscopically, 2,557 samples of various stock feeds, as follows:

In 1903, 203 samples were collected and analyzed.
In 1904, 415 samples were collected and analyzed.
In 1905, 414 samples were collected and analyzed.
In 1906, 317 samples were collected and analyzed.
In 1907, 711 samples were collected and analyzed.
In 1908, 497 samples were collected and analyzed.

In enforcing the law the first two years, considerable attention was given to acquainting manufacturers and dealers with the provisions of the act. During the past four years this has not been necessary to any great extent, and more stress has been laid upon thorough inspection.

The system of inspection is to make a microscopic examination of the feeds in stores or warehouses where they are found, and immediately withdraw them from sale, if adulterated or irregular. By following this plan, the law has been successfully enforced up to the present without a single case of prosecution.

This is the only State that has this system of inspection.

To be able to examine feeds microscopically, the inspector must be a trained microscopist and be familiar with all materials used as adulterants.

Other States have inspectors who have no special knowledge of feeding materials and are not expected to examine feeds, but to take samples to send in to a laboratory for analysis. These samples accumulate, and if some are found adulterated it is often too late to check their sale, as they have already been sold, and if adulterated the consumer has been cheated and the animal has suffered.

Generally manufacturers and dealers willingly comply with the law. Some manufacturers who operated extensively in the State prior to the passage of the feed law no longer offer goods for sale. This is especially true of one company, who probably sold more feed in the State than any other concern, but

to-day do not offer their products for sale in North Carolina, because some of the ingredients in their feeds are barred by the present law. Other similar incidents could be mentioned to show the beneficial effects of the law.

Another evidence of the effectiveness of the law is that it has opened a new field for better and higher-grade feeds that were previously shut out by low-grade and adulterated products.

Branding and Guaranteeing.—Practically all feeds sold in the State are properly branded and guaranteed. Where such is not the case it can generally be traced to negligence rather than willful violation.

Information Concerning Feeds.—The Department, through the feed bulletins and Farmers' Institutes, is endeavoring to show farmers and stockmen how to buy their feeds by analysis, and to take advantage of the differences existing between feeds as shown by the guaranteed analyses they bear.

We are being constantly called upon by dealers and consumers for information concerning the quality of different feeds, their feeding value and their suitability for different kinds of stock, and we readily furnish manufacturers all information we can relative to compounding new and better feeds and the proper guarantee to place upon them.

Standards Adopted.—The present law gives the Department the authority to adopt standards for the different feeds, the following standards having been adopted:

	Protein.	*Fat.*	*Crude Fiber.*
For Pure Wheat Bran	14.50	4.00	9.5
For Pure Middlings	15.00	4.00	6.00
For Pure Bran and Shorts	14.50	4.00	8.00
For Rice Bran	12.50	10.00	10.00
For Rice Meal	11.50	8.00	8.30
For Rice Polish	11.50	7.00	6.30
Mixed Corn and Oat Feed	10.00	4.00	9.00
Linseed Meal	30.00	3.00	10.00
Cotton-seed Meal	38.62	4.00	12.00
Molasses Feeds or Sugar Feeds	10.00	3.25	12.00

No feeds are allowed on sale in this State that contain less than ten per cent protein.

Standards for other feeds will be adopted as soon as the Department has had time to accumulate enough information and analyses to justify it in adopting standards that will be fair to both manufacturers and consumers.

ADULTERATION.

Feeds are as much subject to adulteration as are commercial fertilizers. Before the present feed law went into effect, they were adulterated in this State with materials having but little feeding value, such as ground corncobs, peanut hulls, oat hulls, rice chaff, etc., to a greater extent than commercial fertilizers. The enforcement of the law has gradually driven out this class of goods. Every year has shown a decrease in adulteration, and during the past four years only a few cases of serious adulteration were found. Ordinarily feeds offer a tempting field for fraud and sophistication. The present high prices of all feeding stuffs, however, make it all the more necessary that the consumers' interests should be protected by the proper enforcement of the law.

The execution of the law each year gives increased protection to our feeders and manufacturers, and its benefits are now appreciated.

Twelve hundred and eight samples of feeds were examined, chemically and microscopically, during 1907-1908. These results were published in the Bulletin for November, 1907, and November, 1908. This phase of the Department's work is in charge of Mr. C. D. Harris.

UNIFORM FEED LAW.

In 1906 the Southern States Association of Commissioners of Agriculture, at their meeting in Jacksonville, Florida, appointed a committee to draft a feed law which would meet the conditions existing in the Southern States. I was made chairman of this committee, and, together with Mr. C. D. Harris, Feed Chemist of this Department, have spent much time in drafting a law. To ascertain the millers' side of this question, the law as drafted was submitted by Mr. Harris at a meeting of the Millers' National Federation, at their meeting in Detroit in June, 1908. This body, composed of over one thousand members, after working over the law for nearly three days, made a few minor changes in it, and then approved its provisions, and are now working for its passage in the Southern States. The law was then submitted to the Southern States Association of Commissioners of Agriculture at their meeting in Nashville, Tennessee, in October, 1908. It was here slightly changed and then approved by this association. President Blakeslee, of the above association, appointed a committee, consisting of one member from each of the Southern States, with Mr. C. D. Harris as chairman, to formulate definitions, standards, rulings and regulations in accordance with the law. This committee met in Atlanta in December, with representatives from Virginia, North Carolina, South Carolina, Alabama, Mississippi, Louisiana, Arkansas and Tennessee present. These States will all endeavor to have this law passed, and probably the remainder of the Southern States will also do so.

We consider this the most important and far-reaching step yet accomplished concerning feed inspection.

With a uniform feed law and uniform standards, rulings, regulations and definitions in force in all the Southern States, feed inspection will become much simpler and the law more consistently complied with.

STOCK FOODS AND MEDICINES.

Believing that rigid inspection should be exercised over such foods, feeds or medicines as International Stock Food, Pratt's Food, etc., we have drafted a separate law to cover these products. This law has been drafted in accordance with a ruling from the National Department of Agriculture defining these products. It embraces cattle, horse, sheep, poultry and swine regulators, tonics, condition powders, egg producers and medicines. This is the first time a separate law has been drafted to cover these products, and it is our hope that North Carolina will be the first State to enforce such a law.

SYNOPSIS OF THE FEED LAWS OF ALL THE STATES.

We have published and distributed in pamphlet form a synopsis of the feed laws of the different States, the object of this publication being to place in the hands of manufacturers and dealers a brief, concise statement of the provisions of the different State feed laws, from which they could see at a glance the

requirements of any State. This will avoid violations due to confusion of State laws. This pamphlet has been in great demand and thousands of copies have been sent out on request.

USE OF THE MICROSCOPE IN IDENTIFICATION OF ADULTERANTS IN FEEDS AND FOODS.

A very important means of identification of adulterants in many classes of food products and feeds is furnished by the microscope, which in many cases affords more actual information as to the purity of food than can be obtained by a chemical analysis. This is especially true of flour, meal, breakfast foods, coffee, tea, cocoa, condiments, spices, starches, stock foods and remedies, where the microscope serves to reveal not only the nature of the adulterant, but also not infrequently the approximate amount of foreign matter present. In the case of cereal and leguminous starches, so commonly employed as adulterants, a microscopical examination is of paramount importance.

The chemical constituents of many of the adulterants of coffee and the spices do not always differ sufficiently from those of the pure foods in which they appear to be distinguished therefrom with accuracy and confidence by a chemical analysis alone. On the other hand, one who is familiar with the appearance under the microscope of the pure foods and the starches and various ground substances used as adulterants can with certainty identify very minute quantities of these materials when present. A chemical test may, for example, indicate the presence of starch, but it cannot reveal the particular kind of starch. The microscope will at once show whether the starch present is wheat or corn or potato, etc.

Not only in such instances as these is the microscopical examination of greater importance than a chemical analysis in establishing purity of the food, but it is at the same time a much quicker guide.

Six hundred samples of foods, feeds, starches and miscellaneous materials were examined microscopically during 1907-1908.

STARCHES USED IN COTTON MILLS AND THEIR ADULTERATION.

Early in June, 1907, two samples of starch were sent to this laboratory for examination. One sample was represented to be potato starch and the other corn starch. The corn starch was found to be as represented, but very little potato starch was found in the sample represented to be potato starch. The product was mainly corn starch. This led to the belief that perhaps a mixture of corn and potato starch was being sold for pure potato starch.

After some correspondence with the sender of these samples as to their price and use, it was decided to investigate the quality of the different starches offered for sale in this State. With this object in view, the following circular-letter was sent out to about eighty weaving mills by C. D. Harris, Microscopist, and the samples obtained examined by him:

"DEAR SIR:—We desire to make an investigation of the kinds and quality of the different starches used in cotton mills in this State, for the benefit of the cotton mills. We would appreciate it very much if you will send us a ¼-pound sample of each kind of starch used in your mill. Please send in a sealed package, stating on the package kind of starch, name and address of manufacturer, your own name and address, or mill name and location, price per pound, and, as near as you can, the number of pounds used annually of the different kinds of starches in your mill or mills."

The replies showed much interest and a willingness to co-operate in the investigation. In a short while many samples of starch were received. The samples were examined, both chemically and microscopically, the following objects being in view:

First. To determine whether or not the starch was the kind it was claimed to be.

Second. To determine if any mineral matter, such as talc, tremolite, ground soapstone, plaster of paris or china clay, etc., had been added to give weight.

Third. To determine if there existed any difference in the gluten content of the different kinds of starch and different samples of the same kind of starch.

Fourth. To determine whether the samples were neutral, acid or alkaline.

CONSUMPTION OF STARCH IN NORTH CAROLINA.

It is estimated that about 300 pounds of starch per loom are used in North Carolina annually. There are 52,747 looms operated in the State; therefore there are about 15,824,100 pounds of starch consumed by the cotton-weaving mills alone. Reckoning the average price of all starch consumed at 2½ cents per pound, it is found that about $400,000 is spent every year for starch in this State. The economical expenditure of so large a sum of money is worth considering.

FRAUDS PRACTICED.

The fact that it is impossible to tell the difference between different kinds of starches without the aid of the microscope has been taken advantage of by some manufacturers or dealers to deceive purchasers as to the actual composition of the product. How long the fraud of substituting a cheaper form of starch for a more expensive one has been going on we have no way of knowing. How much money consumers of starch have lost by this deception on the part of manufacturers or dealers cannot be estimated. The fact that 66 per cent of the so-called potato starches examined were found to be mainly corn starch or cassava starch will give some idea of the magnitude of the sophistication.

This Department is willing and stands ready to be of any service it can to the textile manufacturers of the State to put an end to the adulteration of starches. It does not mean to interfere in any way with legitimate trade.

This publication has probably attracted wider-spread attention than any this Department has ever issued. It has been necessary to reprint it three times, and the last issue is almost exhausted. It has been sent out always upon request, and as many as a thousand copies were sent to Boston at one time. Five hundred copies were sent to Columbia, South Carolina. It has gone to every State in the Union, and a dozen copies were requested and sent to the German Government. Every week still brings requests for this publication, and a fourth issue will be necessary in a few months. Since this pamphlet was issued, cotton manufacturers in this State have been rebated by the firms who made and sold them adulterated or misbranded starch to the extent of hundreds of dollars. The frauds exposed in this bulletin have never been defended by the guilty parties. This Department still makes microscopic examinations of starches for cotton manufacturers all over the State. This publication has been a great benefit to the cotton manufacturers, for it has broken up the sale of adulterated starch in this State and many States in the South.

This phase of the Department's work is in charge of Mr. C. D. Harris.

4. Test Farms.

This closes the ninth year's work at the Edgecombe, the sixth at the Iredell, the fourth at the Pender, the fourth at the Transylvania and the first at the Buncombe farms. All experiments, as well as the farms generally, have been conducted during the past two years on the same general plan as outlined in previous reports. Experiments with field crops are repeated, after modifications and extension in accordance with the teachings of continued experience and observation on the different farms from year to year. It is proposed to continue this repetition a sufficient length of time to eliminate abnormalities in season, and thereby secure results that will be reliable for an average year.

The farms are sufficiently large, so that quite a considerable acreage, relatively, can also be devoted to general farming. In this branch of the work the results obtained on the experimental plats with different crops are made of direct application. As most farmers are reached easily through the eye, it is felt that this feature of the work is proving not only an influential factor in impressing visiting farmers with the importance and benefit of the work that is being carried on by the Department in their behalf, but also serves as a source of considerable revenue in aiding in defraying the expenses of the detailed work of the experimental portion.

With field crops the greater portion of the experimental work carried on on the test farms has been in studying the fertilizer requirements, varietal adaptations, cultural treatment and most suitable rotations of the leading crops of the State when grown on our leading soil-type areas, as represented by the different farms.

Fertilizer Experiments.—From the beginning the fertilizer tests have comprised an important feature of the test-farm work. There are at present something like six hundred and fifty fertilizer tests planned and conducted each year. Up to this time most effort has been expended along this line in the study of corn, cotton, cowpeas, peanuts, wheat and oats. With corn and cotton each year between sixty and seventy-five fertilizer tests with each are conducted on one-tenth-acre plats. Twenty-two of these are devoted to different combinations and amounts of the three fertilizer constituents—nitrogen, phosphoric acid and potash—with the view of determining the best-balanced fertilizers and best-paying amounts for these crops on these particular lands. Three plats are given to testing the effect of dividing the fertilizer and applying on one plat half of all the constituents at planting and half later, and in two cases to apply all the acid phosphate and kainit and one-half the cotton-seed meal before planting, putting on the other half of the nitrogen later, as nitrate of soda on one plat and as cotton-seed meal on the other. Two plats are given over to the testing of the effect of lime; a considerable number to comparing cotton-seed meal, dried blood, cotton seed, stable manure, calcium cyanamid, sulphate of ammonia and other new nitrogenous-furnishing materials as sources of nitrogen; six to a study of the effects of applying fertilizers at different depths and in different quantities per acre.

Also, especially during the three years, extended experiments have been planned and put out with the idea of comparing the relative value of different carriers of both phosphoric acid and nitrogen. In these tests from seven to ten different experiments with both cotton and corn have been conducted with each of the following fertilizing materials: nitrate of soda, "fillerine," Thomas or basic slag, and ground phosphate rock.

With Cowpeas and Peanuts.—Sixty fertilizer tests with cowpeas at the Iredell and Edgecombe farms and thirty-three with peanuts at the Edgecombe farm have been conducted. Quite a number of experiments designed to study the fertilizing requirements of alfalfa have also been put out. These tests are all along the same general scheme as those outlined above for cotton and corn. It is felt that much definite and valuable information as to the manurial requirements of these different legumes is being accumulated. The results from these experiments, when they have been conducted a sufficient length of time, will be brought together in tabulated form and such practical deductions made from them as the data warrant. In all the fertilizer tests with cowpeas one-half of each plat is cut for hay, while from the remaining half the peas are picked.

With Wheat.—Something like twenty fertilizer tests with wheat have been conducted at the Iredell farm. These wheat experiments are in rotation with cowpeas, the work being so planned that the formula of the fertilizer applications received by any one plat is the same for both wheat and cowpeas, although the actual application and proportion of fertilizing constituents is different for the different crops, due to the fact that the normal application or manurial requirements for each is not the same. For example, plat 6 received the normal (N K P) application with both the cowpea and wheat mixtures, and so on throughout the tests.

Variety, Culture and Distance Tests with Corn and Cotton.—Something over fifty varieties of corn have been studied in co-operative field tests on one-twentieth to one-tenth acre plats at the Edgecombe, Iredell, Transylvania and Buncombe farms up to the present, and over forty kinds of cotton on the Edgecombe and Iredell farms. The results of these tests have frequently been very striking, due to the great difference in yield of different varieties under identical conditions of soil, fertilization, cultivation, etc. About thirty distance, variety-distance and culture tests with cotton have been conducted at the Edgecombe and Iredell farms during the past four years to study the best distancing between rows and plants in the row, as well as the most favorable and economic cultural treatment.

With Cowpeas, Peanuts and Alfalfa.—Thirty varieties of cowpeas, four or five of peanuts, and seed of alfalfa from a number of sources have been tested. This work, with peanuts, has been conducted at the Edgecombe farm and on the farm of an individual grower in Hertford County (Mr. T. E. Browne). Experiments to determine the best quantity of seed per acre of cowpeas, as well as the most favorable distancing and number of plants per hill, have been conducted at both the Edgecombe and Iredell farms.

With Wheat.—At the Iredell farm during the past five years a study of more than twenty varieties of wheat has been made on the same general plan that has been followed with corn and cotton.

Rotation Tests with Corn and Cotton.—In the fertilizer test series ten plats are devoted to each of these crops to see if vetch, peas, bur clover, velvet beans, soja beans and peanuts—winter and summer growing gatherers—will not collect from the atmosphere all the nitrogen required for the growth of these crops. Also, a study is being made of the effects upon yields of short rotations of both corn and cotton with bur clover, crimson clover and hairy vetch. These experiments are on a rather large scale, and a crop of corn and cotton is produced each year. By the rotation of bur clover with corn the yield of corn on

the same land has been raised from twelve to fifteen bushels per acre to forty or more within the past three or four years. Another rotation tried with promising results is as follows:

(1) First year, peanuts, followed by wheat; second year, wheat, followed by cowpeas; third year, corn, with cowpeas at last cultivation; fourth year, cotton.

Breeding Tests of Corn and Cotton.—Work is in progress to increase the yield of these two crops through more intelligent selection of seed. Also, effort is being made to improve the shape of one of our leading varieties of corn and to increase the percentage of lint to seed of cotton, as well as the study of the effect of such work upon the diameter of the staple and the percentage of oil in the seed.

Pender Farm.—The Pender farm is devoted mainly to the study of truck and horticultural crops, in testing varieties, fertilizer treatment, methods of culture and handling, etc. A considerable area has been put out in pecans to ascertain the varieties which will give best results on that soil. These tests are being repeated on the Edgecombe and Iredell farms to determine the area in the State where pecans can be grown to advantage.

In co-operation with the United States Department of Agriculture there are being brought together on this farm all the varieties of the Scuppernong grape, with a view of studying them and determining the best methods of pruning, training, fertilizing, cultivating and handling.

Transylvania Farm.—During the past year this farm has been run with a view of making it meet expenses as nearly as possible and at the same time take care of what experimental work had been put out on it. An orchard of eight to ten acres was planted four years ago and is making fair progress. When it comes into bearing we should obtain from it valuable data as to the varieties of apples best suited to that section of the State and information regarding elevation and exposure. A home orchard has been put out around the house and some work with varieties of corn and fertilizer tests conducted.

Buncombe Farm.—We have been on this farm less than a year and have only been able to make a fair beginning. We feel that it is an excellent place, from the standpoint of location and accessibility, and should prove to be one of our most valuable farms. Our work this year has been mainly in testing varieties and fertilizer treatment for oats, corn and potatoes. The fertilizer tests with these crops have been especially valuable, as they show the soil to be quite one-sided in its fertilizer requirements; and if repetition of the experiments confirm the experience of the present year, they will result in much saving of fertilizers on that type of soil. It is too early to go into a report of the results.

Farmers' Interest in the Farm Work.—The increasing interest of farmers in the working and results of the test farms is demonstrated by the greatly augmented number that visit the farms each succeeding year. These visits are not confined to any one season of the year. They are usually made either to study the different farm crops growing on the farms under different cultural, fertilizer, etc., treatments, or else to seek information from the superintendents on different subjects pertaining to farming operations.

5. Soil Work.

During the past two years soil maps have been made by the Bureau of Soils of the United States Department of Agriculture, in co-operation with this

Department, of Henderson, Robeson, Caswell and Edgecombe counties, and a map of Pitt County is now being prepared. The following counties have been mapped: Henderson, Robeson, Caswell, Edgecombe, Duplin, New Hanover, Chowan, Pasquotank, Perquimans, Transylvania, Alamance, and more or less of the following ones covered: Iredell, Rowan, Lincoln, Catawba, Alexander, Caldwell, Yancey, Mitchell, Buncombe, Haywood, Craven, Jones, Lenoir and Pitt. These maps have been made on a basis of the county as a unit, and, when taken in connection with the areas heretofore mapped, amount to 20 to 25 per cent of the total area of the State. An arrangement is now in operation with the Bureau of Soils by which a man is detailed for permanent work in the State, along with a worker from this Department. This will enable us to proceed with the mapping of the soils of the different counties somewhat more rapidly, as the work will be continuous, and will enable us, when certain important areas are completed, to bring together the results to a better advantage for us in connection with the test farm and other work of the Department. We are getting together data with the view of issuing a report descriptive of the soils of the several counties worked, the crops generally grown in them, the crops best adapted to the different soils, and the fertilization best suited to these soils and crops, together with other data, which will be of interest and value to the present residents of those counties and to persons who may have in mind to purchase lands or properties in them.

In the past eight years a large number of samples of soils have been collected in the soil-survey work and analyses made of them in the laboratory. The number now amounts to between 800 and 1,000. These analyses, together with the experiments on the test farms, have thrown much light on the fertilizer requirements of the soils, together with the crops which are best suited to them. In the immigration work which the Department is doing we find that many of the inquiries which come regarding land ask for specific information as to certain types of soils, where they can be found and what can be grown on them to best advantage in the State. The reports referred to above, and which we have in mind issuing, will cover all of these points and will enable us to give clearly and in a more satisfactory way the information which is generally desired by settlers regarding the soils and the agriculture of the several counties.

CORRESPONDENCE.

Our correspondence continues to grow in connection with all phases of our work, showing the increased interest with which our endeavors in these several lines are followed.

Very respectfully,

B. W. KILGORE,
State Chemist.

IMMIGRATION.

HON. W. A. GRAHAM, *Commissioner,*
and Chairman of the Board of Agriculture.

DEAR SIR:—No active work along the line of foreign immigration has been done since the panic of 1908. Still we have received through our agents sixteen Scotch and English, and six families have come from other States. Four of these families are from Ohio, one from Michigan and one from Indiana, and most of them have purchased farms.

The total for the past two years is eighty-nine foreigners, thirteen families and several men from other States.

There are certain localities from which we have received many inquiries. I would suggest that special efforts be made to lay before these people the advantages that North Carolina has to offer to home-seekers; that this be done by making exhibits of farm products, together with lantern pictures, literature, etc., and that these exhibits be thoroughly advertised, locally, before they reach these points. Most of the material, with cases to pack the same, and colored lantern slides have already been collected.

Lists of farm lands offered for sale through the Department have been published in four pamphlets—Mountain, Piedmont, Coastal Plain, and Tidewater sections.

We have advertised the advantages of the State in the Northern, Western and Northwestern papers, but with unsatisfactory results, caused, I am sure, by the inopportune time at which the advertisements were placed. From information I have since gained, I am sure the results would have been different had the advertising been done in the fall and winter.

Corporations and private parties have done good work in immigration, notably the Carolina Trucking Development Company. The Department heartily co-operates with each and every one in this work.

Lists of all parties making inquiry through the Department with a view of purchasing property in this State are given to the papers for publication. To prove the effectiveness of this plan, I received a letter from one of the inquirers saying he had received twenty-five letters in the last few days from parties in this State wishing to sell him farm lands.

I believe, from my own observation and from correspondence with many engaged in and interested in immigration work, that much has been accomplished through this Department in advertising the State's resources and in wiping out to a great extent in the North and West that feeling of prejudice against our State which has so long existed, and that we may now hope to begin to reap benefits resulting in part from work already done.

Respectfully submitted,

ELIAS CARR,
Secretary.

REPORT OF VETERINARIAN AND DIRECTOR OF FARMERS' INSTITUTES.

HON. W. A. GRAHAM, *Commissioner of Agriculture.*

DEAR SIR:—Pursuant to your request, I herewith submit the following report of the work of the Veterinary and Animal Husbandry Division and of the Farmers' Institutes:

CONTROL OF INFECTIOUS DISEASES.

No unusual or serious outbreak of a contagious disease has occurred in the State during the last two years. This division cannot, nor does it attempt to, treat individual cases of diseased animals, except by correspondence; still it is our policy to visit all reported outbreaks of contagious or infectious diseases and all outbreaks of any disease when a sufficiently large number of animals are affected to render it of general interest to a community.

Glanders.—From time to time isolated outbreaks of glanders are reported, but by prompt action in quarantining all diseased animals these outbreaks have been controlled and the infection prevented from becoming general.

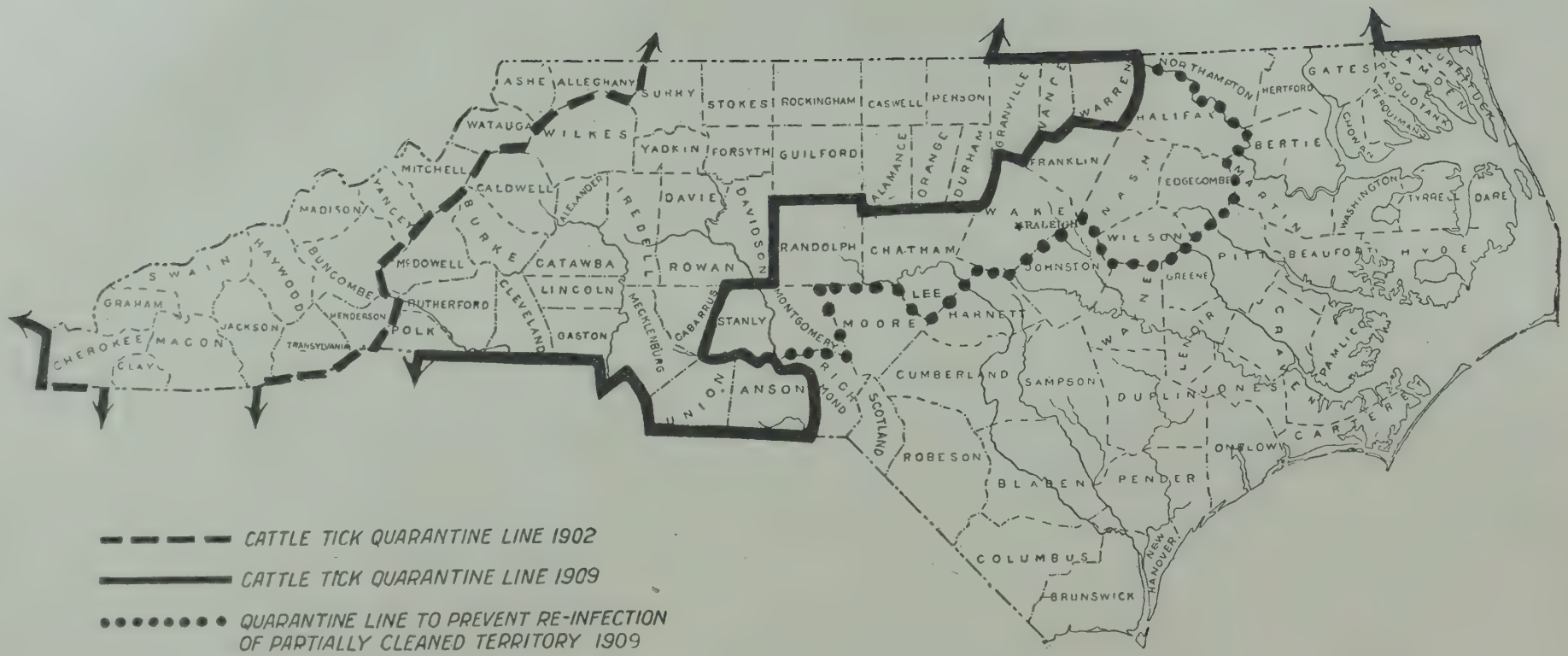
Tuberculosis.—As heretofore, we have continued the tuberculin testing of cattle, when the owners requested the same and were willing to comply with such conditions as would insure the eradication of tuberculosis from the herds in which it was found. The only reason for the Department doing this work is that healthy herds may be secured and maintained free of tuberculosis for the protection of the cattle interests and public health of the State. Therefore, an agreement has been required of all those for whom testing has been done which will insure these desired ends. Numerous herds have been tested under this arrangement, the diseased animals removed and clean herds maintained. Under the same arrangement the herds supplying milk to some of the larger cities of the State have been tested.

The amount of tuberculosis in the farmers' herds of the State is almost a negligible quantity; and with only a small percentage of the dairy cattle affected, with a supporting public sentiment in the State, it would not be a difficult task to eradicate the disease.

Cattle Quarantine and Tick Eradication.—In addition to co-operating with the Federal authorities in maintaining a cattle quarantine line across the State, through the effect of which a large number of western counties are enabled to reap the benefits of their freedom from ticks in an unrestricted cattle traffic, the Department has continued the work of tick eradication. The work during the past two years has served not only to further demonstrate the feasibility of exterminating the fever ticks in all "stock-law" sections, but the small cost at which the work has been done also proves that it is easy, practicable and profitable.

During the past two years the Federal Department of Agriculture has had a large force of men in the State co-operating with the State Department of Agriculture in the work of tick eradication, and have during that time spent four or five times as much money as the State in this work.

Since the last biennial report, or since 1907, the following counties have been released from cattle quarantine restrictions because of the eradication of the cattle ticks: Stokes, Rockingham, Caswell, Person, Granville, Vance, Warren, Durham, Orange, Alamance, Guilford, Union and Anson. The following map shows the lines for 1909 and the area cleared of ticks and removed from quarantine since 1902:


ASHE
ALLEGHANY
SURRY
STOKES
ROCKINGHAM
CASWELL
PERSON
WATAUGA
WILKES
YADKIN
FORSYTH
GUILFORD
ALAMANCE
ORANGE
DURHAM
GRANVILLE
VANCE
WARREN
NORTHAMPTON
HERTFORD
GATES
CAMDEN
CURRITUCK
PASQUOTANK
PERQUIMANS
CHOWAN
HALIFAX
BERTIE
MITCHELL
CALDWELL
IREDELL
DAVIE
DAVIDSON
FRANKLIN
EDGECOMBE
MARTIN
WASHINGTON
TYRRELL
DARE
MADISON
YANCEY
BURKE
ALEXANDER
WAKE
RALEIGH
NASH
WILSON
PITT
BEAUFORT
HYDE
SWAIN
HAYWOOD
BUNCOMBE
MCDOWELL
CATAWBA
ROWAN
RANDOLPH
CHATHAM
JOHNSTON
GREENE
GRAHAM
RUTHERFORD
LINCOLN
LEE
HARNETT
CHEROKEE
MACON
JACKSON
HENDERSON
POLK
CLEVELAND
GASTON
MECKLENBURG
CABARRUS
STANLY
MONTGOMERY
MOORE
WAYNE
LENOIR
CRAVEN
PAMLICO
CLAY
TRANSYLVANIA
UNION
ANSON
RICHMOND
SCOTLAND
CUMBERLAND
SAMPSON
DUPLIN
JONES
CARTERET
ONSLOW
ROBESON
BLADEN
PENDER
COLUMBUS
NEW HANOVER
BRUNSWICK
CATTLE TICK QUARANTINE LINE 1902
CATTLE TICK QUARANTINE LINE 1909
QUARANTINE LINE TO PREVENT RE-INFECTION OF PARTIALLY CLEANED TERRITORY 1909

DAIRY DEMONSTRATION WORK.

A uniformly high price for first-class dairy products and facilities for producing cheap forage are unquestionably two important factors in successful dairy husbandry. North Carolina has both of these, but, nevertheless, as at present conducted, dairying is not generally profitable in the State. Moreover, it is a demonstrated fact that where dairying is not now profitable it is chiefly due to a lack of personal attention to proper business management or a failure on the part of the dairyman to fully use in a practical way the large amount of dairy information available to any man who intelligently studies the business. In other words, where dairying is not now successful in this State it is usually the fault of the dairyman rather than the existing unfavorable dairy conditions beyond his control. To be more specific, dairy failures in North Carolina are chiefly due to a failure to study, know and follow the teachings of modern dairy science and a lack of personal attention to business management.

Recognizing the foregoing facts, the Dairy Division of the United States Department of Agriculture began dairy demonstration work in this State nearly two years ago with the direct purpose of assisting our dairymen to obtain better results. During this time the North Carolina State Department of Agriculture has in a limited way co-operated with the Federal workers, and at its last meeting the State Board of Agriculture made an appropriation for the support of this work, in order that the co-operation might be more effectual and complete.

METHOD OF CONDUCTING THE WORK.

The method of conducting this work has been about as follows:

An expert dairyman of experience has been regularly employed, and during the summer, when the work was such that one man could not attend to it all, an additional man has been temporarily engaged. These men have visited the farms of dairymen in various parts of the State and endeavored to assist them in obtaining better results. At the first visit to a farm the entire plant is carefully looked over, the methods of conducting the business are inquired into, the manner of feeding is studied, the kind and quality of the products examined and the market price learned.

After becoming familiar with the present workings of the dairy, the demonstrator is in a position to make suggestions for future improvements; but unless the dairyman is willing to do his part and is fully interested and anxious to co-operate in the work, nothing of value will be accomplished.

If the dairyman is willing to do the extra work necessary to obtain sufficient information relative to the herd to enable the demonstrator to assist him, the work will be taken up in earnest and systematically conducted.

The work already done shows that in practically every herd there are many unprofitable cows, which largely consume the profits from the good ones. To find out which cows are unprofitable it is necessary to weigh the milk, test it and ascertain the amount of butter fat it contains, and weigh the feeds. When this is done for a few months, the data are obtained necessary to enable the dairyman to weed out his unprofitable cows.

To help the dairyman obtain this necessary information, scales for weighing the milk are loaned him and blank milk-record sheets furnished. The time required to weigh the milk at each milking from each cow during the entire year would not equal the loss from feeding one unprofitable cow for that length

of time. The feed should be weighed three or four times a month and all changes noted and record made of the same.

At first the samples of milk for testing for butter fat are taken by the demonstrator and the test made by him. The next and subsequent months the dairyman will take the milk samples for two days immediately preceding the regular monthly visits of the demonstrator, who will make the tests for butter fat.

The dairyman must keep these necessary records, and is expected to assist in calculating the results.

In the handling of the dairy products the expert will give all the assistance possible, with a view of enabling the dairyman to put upon the market a first-class product.

BUILDING OF SILOS.

In feeding, the advice and assistance of the demonstrator is frequently of great value. As a rule, our dairymen do not produce their own feed to the extent they should, nor do they give sufficient care to the character of the feeds to obtain the best results. Silos are too rare, and yet succulence is essential in dairy feedings. All dairymen are advised to use silos, and those who wish to build them are assisted to do so.

The most desirable kind of silo for the conditions existing on the farm is determined and plans and specifications furnished free of charge. When the materials are on the ground the demonstrator will supervise the erection of the silo, and later will direct the filling of it, in order that the dairyman may run no risk from lack of experience in such matters.

DAIRY-BARN PLANS.

If a dairy barn is needed, the demonstrator will advise concerning its location and construction, even to the extent of furnishing plans, etc.

In all these and in many other ways the dairymen of the State may receive the assistance of an expert dairyman if they are sufficiently interested to do their part of the work, but no dairyman can be helped who will not help himself.

MOVABLE DAIRY SCHOOL.

The first movable short course in dairying held in this State was conducted by representatives of the United States and State Departments of Agriculture at the farm of Jonathan Case, Dana, Henderson County, October 26th to 30th. The following program was carried out:

Monday, October 26th.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Corn Harvesting; Silo Filling.
3:00 to 4:00 P. M.—Feeds.

Tuesday, October 27th.

9:00 to 12:00 A. M.—Cleaning Cattle; Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Diseases of Dairy Cattle.
3:00 to 4:00 P. M.—Herd Records.
8:00 to 9:30 P. M.—Clean Milk and Silo Building (illustrated with lantern views).

Wednesday, October 28th.

9:00 to 12:00 A. M.—Judging Cattle; Separating Cream; Milk Testing.
2:00 to 3:00 P. M.—Home-grown Feeds.
3:00 to 4:00 P. M.—Dairy Buildings.

Thursday, October 29th.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Pastures.
3:00 to 4:00 P. M.—Feeding.

Friday, October 30th.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing; Butter Judging.
2:00 to 3:00 P. M.—Flies in Relation to Clean Milk and Health on the Farm.
3:00 to 4:00 P. M.—Herd Records (figuring out records of herds in the neighborhood).

There were about thirty regular attendants at this school, who took a deep interest in the work. This short course in dairying was conducted by:

Mr. J. A. Conover, the expert dairyman, who has for the last two years been in charge of the dairy demonstration work conducted in North Carolina by the United States Department of Agriculture and the State Department of Agriculture.

Mr. B. H. Rawl, Dairy Expert, United States Department of Agriculture, Washington, D. C.

Dr. Tait Butler, Veterinarian and Director of Farmers' Institutes, North Carolina Department of Agriculture.

Mr. L. M. McCormick, Chief of the Sanitary Department, Asheville, N. C.

It is the purpose of those having in charge the dairy demonstration work in this State to hold several of these dairy schools in different parts of the State, where satisfactory facilities can be secured and the interest is sufficient to justify the effort.

There is a good demand in this State for first-class butter at remunerative prices, and yet more than half the butter made in the State is sold for less than half the price which the first-class product commands on our markets. At these short-course dairy schools special attention is given to butter making, which affords all interested an opportunity to learn how to make better butter by actually doing it under the direction of an expert butter maker.

FEEDING BEEF CATTLE.

The work of the State Department of Agriculture on its test farms during the past three years has demonstrated that, with our cheapest available feeds and proper facilities for handling the animals, the feeding of beef cattle may be made profitable, at least, throughout the central and western parts of the State. It is a fact, however, that the feeding of beef cattle is not generally regarded as profitable in this State.

Good feeders are too scarce, freight rates too high, and the feeds generally used too high-priced to permit of the profitable feeding of beef cattle, especially if the full value of stable manure be ignored, as is very generally done in this State.

By using a ration consisting of corn silage and corn stover, both cheap feeds and readily produced on the farm, and cotton seed and cotton-seed meal, cattle feeding may be made profitable, if proper care and intelligence be given to the purchase and care of the feeders and a fair valuation given to the stable manure.

Silage is one of the cheapest and best feeds for beef cattle, and, in cases where it is not necessary to provide extra power to drive the machinery for filling the silo, it should be used by every feeder of cattle. As is being done with the dairymen of the State, the Department of Agriculture will be pleased to furnish plans and assist in the erection of silos for any farmer in the State who contemplates erecting a silo for the feeding of beef cattle or other live stock.

The Department is anxious to encourage the feeding of more cattle for the building up of our worn and depleted soils, and would like to co-operate with every man in the State who expects to feed beef cattle in car load or half-car load lots next winter. If desired, an expert cattleman will be sent to the farm of the feeder and advise regarding the purchase of the cattle, the feeds to be used, and the care and marketing of the animals.

Any farmer in the State wishing the assistance of the Department in animal husbandry lines should write Dr. Tait Butler, Raleigh, N. C.

FARMERS' INSTITUTE WORK, 1908.

During the last year (December 1, 1907, to December 1, 1908) there have been held 234 institutes under the direction of the State Department of Agriculture. Of these 151 have been regular Farmers' Institutes for men, 14 Orchard Demonstration Institutes, 67 institutes for women and one five-day Short-course Dairy School. In addition, a "round-up" institute, or, as it is generally known, State Farmers' Convention, was held, embracing separate meetings for both men and women.

Institutes have been held in 95 of the 98 counties of the State—all except Dare, Carteret and New Hanover. The number of institutes held this year has been greater than ever before, as the following will show:

1898— 28 institutes in 27 counties.
1903— 17 institutes in 16 counties.
1904— 58 institutes in 58 counties.
1905— 79 institutes in 76 counties.
1906—136 institutes in 91 counties.
1907—169 institutes in 93 counties.
1908—234 institutes in 95 counties.

The number of institutes held this year has been larger than ever before. Counting special institutes, there has been an increase of 64 over last year, which exceeded any previous year by 33.

The institutes for men, exclusive of round-up or dairy short course, held during this year numbered 162, exceeding those of any previous year by 43, while 69 institutes were held for women, exceeding any previous year by 19.

Even with this large increase it was not possible to supply the demands for institutes. While a few institutes were held in new localities where none had previously been held and from which no requests for institutes had been made, still the total number of requests considerably exceeded the total number of institutes which it was possible for us to hold.

From the experience of the last few years it is plain that in the near future not less than an average of at least three institutes to the county will supply the demand.

ORCHARD DEMONSTRATIONS.

During February, 1908, several orchard demonstration institutes were held in the apple-growing regions of the State to show the best methods of pruning and spraying fruit trees. The meetings were held right out in the orchards, where the demonstrators could actually do the work and have the trees to illustrate what they were talking about.

The orchards in which the demonstrations were given were selected beforehand, on account of convenient and central location. The trees used in the demonstration were generally near a road, where they could be under observation throughout the season, so that the results of the demonstration could be noted.

Demonstrations were given in the following counties: Stokes, Surry, Alexander, Wilkes, Caldwell, Watauga, Henderson, Haywood, Jackson and Swain.

PRUNING.

The demonstration of pruning proceeded about as follows:

1. The fruit growers present were taken through the orchard, and the best forms of trees for commercial orcharding were noted.
2. Those present picked out a tree which they desired to see pruned.
3. The demonstrator outlined the method of growth in trees and explained the reasons for pruning.
4. The origin of fruit-buds and their development were explained.
5. Pruning tools of different kinds were shown and their uses explained by the demonstrator.
6. The tree was pruned and the principles of pruning and the why and wherefore of each step explained while the work was being done.
7. The pruned and unpruned trees were compared.
8. How to properly remove a limb and treat the resulting wound was demonstrated.
9. Different kinds of trees were pruned. For example, apple, pear, peach, plum, etc.
10. The pruning and training of a young tree was explained and demonstrated.
11. Methods of renovating old and neglected trees were shown.
12. Tools were distributed to those present and trees were pruned by them, under the direction of the demonstrator.
13. A general discussion of the subject of pruning followed these demonstrations, and questions were freely asked and answered.

SPRAYING.

At the conclusion of the pruning work described above a demonstration was given of the spraying of fruit trees, to prevent damage by insects and diseases, and to improve the quality of the fruit. The general method followed was similar to that of the pruning demonstration, and the trees which had already been pruned were used in the spraying demonstration.

1. A brief account was given of the most serious orchard insects which are combatted by spraying, and when present these were pointed out in their actual natural location on the trees.

2. A complete barrel-spraying outfit for commercial orchards and a complete bucket outfit for family orchards were exhibited, explained and put together, ready for work.

3. The manner of measuring out and dissolving the ingredients for making the *Bordeaux Mixture and Paris Green* was explained and the mixtures prepared before the audience.

4. The trees were thoroughly sprayed, the process being fully explained in every detail. Members of the audience were encouraged to take part in the work.

5. Different nozzles and extension rods were used to show their adaptability to different uses.

6. A general discussion of the subject of spraying followed, with the asking and answering of questions.

Twice during the growing season a representative from this office has gone to these orchards again, each time giving another application of the same spraying mixture.

It would be very desirable to give more demonstrations of this kind in the future, not only in the western counties, but in the piedmont and eastern sections as well—particularly in counties where fruit is grown for distant shipment or to supply local markets, and where the methods of spraying are not now well understood.

Demonstrations of similar character, and using the same mixture, should be made with other crops, especially Irish potatoes, grapes and melons. With all of these it is fully established that spraying is profitable in average seasons, and it only remains to adequately demonstrate to the growers the methods and the value of the operation.

GRADING AND PACKING.

During the fall demonstrations were given in these same orchards on the picking, grading and packing of apples for the best wholesale trade. By these demonstrations it is hoped to assist our fruit growers to make use of our splendid natural facilities and to encourage them in the development of a great commercial fruit industry.

DEMONSTRATION RAILWAY CARS.

For many years special trains or cars have been run in a large number of States for the purpose of carrying institute workers and materials for illustrating their work. But with the exception of the Corn Growers' Special, run by the Experiment Station of the A. and M. College, C. B. Williams, Director, and the N. and S. Railway, during March, 1908, no use of this means of conducting institutes had been made in the work in this State.

The special trains are usually run so as to devote at most a few hours at a place, from three to ten stops being made each day. In this way much spectacular effect is obtained, but facilities and opportunities for teaching are sacrificed. While one whole day is all too little, if much real instruction is to be given, there is unquestionably much to be gained in effective work by the facilities which one or two cars offer for carrying materials, apparatus and implements for demonstrations.

During the past institute season it was determined to use two cars, one for domestic science demonstrations and the other for agricultural implements, seeds, spraying and dairy apparatus, etc., for demonstrations at the men's meetings.

The institutes were held as usual, three sessions being held, forenoon, afternoon and night, in order that nothing might be lost in facilities for instructional work, but that materials might be present for demonstrations.

A passenger coach, from one end of which two seats were removed, was fitted up as a modern kitchen with labor-saving utensils and devices. In this kitchen was an oil stove, oven, ice-box, kitchen cabinet, fireless cooker, sink and necessary utensils. The remaining seats of the car were utilized for seating those attending the demonstrations, and when the attendance was not too large the women's institute was held in this car.

It is believed that this is probably the first domestic science car ever run, but it clearly demonstrated its utility in rendering more effective the work of the women's institutes by offering facilities for actual demonstrations of many of the things taught.

Another car was filled with modern improved agricultural implements, etc., and whenever practicable the farmers furnished teams and these implements were taken to the fields and their working demonstrated.

These cars were furnished and hauled free of charge by the Southern Railway, through the courtesy and co-operative assistance of Mr. M. V. Richards of the Land and Industrial Department of the road.

These cars were used at thirty institutes, separate meetings for the men and women being held in the forenoon and for a part of the afternoon, and joint meetings for the remainder of the afternoon and at night.

The results obtained were more than satisfactory, especially with the domestic science car, and it is felt that this use of the car for the purpose of adding better facilities for teaching is the proper use of the special institute car or train rather than the spectacular effect which has apparently been the chief aim and must result from the short time usually spent at each stopping place with the special institute train.

Respectfully submitted, TAIT BUTLER,

Veterinarian and Director of Farmers' Institutes.

REPORT OF ENTOMOLOGIST, 1907 AND 1908.

MAJ. WILLIAM A. GRAHAM, *Commissioner of Agriculture.*

SIR:—I submit herewith report on the operations of the Division of Entomology for the two years 1907 and 1908. These matters can be best treated under separate heads.

NURSERY INSPECTION.

For eight years past the inspection of the nurseries of the State has been carried out on one consistent, permanent plan. Although there have been a number of different persons employed in the work, the methods, the general policy, and the supervision has remained constant. This has greatly increased the confidence of the nurserymen in the work, and has given us more and more information concerning them every year, until we now feel that we know the conditions quite thoroughly.

The object of these inspections is to find out whether the San José Scale or other serious pests are present in the nurseries and to take such action, when it is found, as is needed to give the customer reasonable protection. No nursery in the State can legally carry on a trade without having a certificate of inspection from us. It is no secret that the San José Scale is found in nurseries in all the Eastern States (including North Carolina) every year, and even the infested nurseries are given certificates if they so meet our requirements in destroying all visibly infested trees, all badly infested fields or blocks, etc., so as to render the sale of their stock reasonably safe. In addition to all these precautions, it is required that all fruit-tree stock must be fumigated before shipment, with a gas which is fatal to San José Scale and other insects. By these various means good protection to the customer can be secured if the nurseryman takes hold of the matter energetically—and we do not give certificates to infested nurseries until they have proven their faith by their works in this way.

In 1906 we were able to make the first truly *thorough* and *searching* inspection of our nurseries—not that the work had been neglected before that time, but that year, through the employment of an assistant and a suitable arrangement of our work for the summer, we had the time and opportunity to make a closer and more painstaking examination than in any previous year. The conditions showed that it was very necessary to have some one assigned continually and permanently to this inspection work, and the inspections for 1907 and 1908 have, therefore, been made by men assigned particularly to this line of work, and who are directly responsible for the results. Mr. L. M. Smith was the first inspector, and did most of the work up to about October 1, 1907, when he resigned and was succeeded by Mr. S. C. Clapp of Guilford County, who has continued the work since. The degree of infestation has decreased very greatly during the past two years.

ORCHARD INSPECTIONS.

As a companion task to the inspection of the nurseries, we also conduct a system of orchard inspections, directed more especially to orchards intended for commercial purposes. The inspector visits these orchards, traverses them in different directions, and examines trees in all parts to see if San José Scale

or other serious pests are present. The results have been good. A grower in Catawba County, where Mr. Clapp spent several days inspecting, wrote: "There will be fourteen new sprayers put into use in this section this year that I know of." Another grower in Surry County wrote, after many inspections in his vicinity, that there were "fully ten times as many trees sprayed in that neighborhood as in years previous."

The number of trees in the orchards which have been inspected is large, and gives an idea of the real magnitude of the work. The following condensed table for the two years may be of interest:

INSPECTION OF COMMERCIAL ORCHARDS, 1907 AND 1908 (TO DECEMBER 1).

Year.	Number of Commercial Orchards Inspected.	Number of Trees in the Inspected Orchards.	Number of Orchards Found to Have San Jose Scale.	Number of Trees in the Infested Orchards.
1907	84	251,145	65	190,650
1908	143	195,264	62	89,307
Total	227	446,409	127	279,957

In addition about 75 small family orchards (principally in town and city lots) have been inspected, having a total of over 3,000 trees. We have considered it our duty, however, to direct our attention mainly to the commercial orchards, which represent most of money value to the State. We are now beginning to give attention to family orchards on the farms.

DEMONSTRATIONS IN SPRAYING OF ORCHARDS.

During the spring of 1908 we carried out practical demonstrations in the spraying of apple trees in the orchards of actual fruit growers in five different counties in the western part of the State, where apple growing is an important and increasing industry. At each of these places three or four bearing trees were used in the work, one of which was sprayed on only one side, the others being thoroughly sprayed all over. These demonstrations were widely advertised and a number of growers gathered to witness the work and to learn from it. These demonstrations were conducted at the following places:

Stokes County, in orchard of J. W. Spainhour, at King.

Alexander County, in orchard of R. B. Lowe, near Poors Knob.

Caldwell County, in orchard of J. A. Dula, near Lenoir.

Henderson County, in orchard of Jonathan Case, at Dana.

Jackson County, in orchard of George P. Miller, at Sylva.

In each case these men sent me reports in midsummer and in autumn after apple harvest, and in each and every case the reports were not merely satisfactory, but even exceeded our expectations. In every instance the sprayed trees were at once distinguished from the unsprayed, both by the more healthy and luxuriant foliage, and on account of the larger, better and more abundant fruit, which kept better after it was gathered. These tests were entirely convincing to those who watched them, and we expect much good to result from them.

We are positive and sincere in the belief that, in the work of protecting the nurseries (and their customers) by nursery inspections, by inspecting the or-

chards to locate troubles and to indicate remedies for them, and by following this up with practical demonstrations in the spraying of orchards to secure larger crops of better fruit, we are furnishing a real and substantial basis for the present activity in fruit growing. While we could wish that this work were many times more extensive and far-reaching, yet we feel confident that considering the means at our disposal the results have been more than could have been reasonably demanded.

FARMERS' INSTITUTES.

The growth of farmers' institute work, under the management of Dr. Butler, has caused your Entomologist to give much time (at Dr. Butler's request) to this important work, and next to Dr. Butler, the Entomologist has attended about as many institutes as any other worker on the entire institute force. Aside from some extra institutes of special character (such as the spraying demonstrations already referred to) your Entomologist has attended institutes in the following counties:

1907 (31 institutes)—Alexander, Alleghany, Anson (2), Ashe, Bladen, Brunswick, Caldwell, Catawba, Cleveland, Columbus, Craven, Davidson, Davie, Forsyth, Gaston, Guilford, Iredell, Jones, Lenoir, Lincoln, Mecklenburg, Onslow, Pamlico, Randolph, Rowan, Stanly, Surry, Watauga, Wilkes, Yadkin.

1908 (32 institutes)—Buncombe, Caswell (2), Cherokee, Clay, Davie (2), Franklin, Graham, Granville, Haywood, Henderson, Jackson, Macon, Mecklenburg, Person, Polk, Rockingham (2), Stokes (2), Surry (2), Swain, Transylvania, Vance, Wake (2), Warren (2), Wilkes, Yadkin.

At each institute two talks are given, one on the subject, "Insect Pests and Remedies, Spraying," etc., and the other on "Suggestions for Improving the Farm Life."

INVESTIGATIONS RELATIVE TO INSECT PESTS.

It must not be presumed that the economic bearing of entomology is confined to orchard protection. It is true that in this industry it finds its most conspicuous field, and it is here that it is able to show most spectacular results, but there is an enormous aggregate of insect damage among all sorts of farm and truck crops. Witness the annual ravages and spread of the Cotton Boll-weevil in the States to the south of us, and the destruction of the Gipsy and Brown-tail moths in New England. While these conspicuous pests are not yet known in our borders, we have others whose ravages are truly startling. In the spring of 1904 the Strawberry Weevil did not less than $100,000 damage in the berry-growing region between Mount Olive and Chadbourn, and it has done considerable injury since. The Flea-beetle was exceedingly destructive to tobacco in 1907, while the same crop suffered more than usual from Bud-worm in 1908. In the piedmont counties fall-sown wheat and oats were badly damaged by the Spring Grain Aphis in 1907, while in the same piedmont region elm trees (highly valued for their shade) have suffered much from the Elm Leaf-beetle during the last six years. Cotton suffered seriously from Boll-worm in 1907, and studies made during the last few years bring to light at least three insect enemies to cotton which had not been recognized before in this State, namely, the Cotton Root-louse, the New Cotton-beetle, and the Cowpea Pod-weevil.

We have scores of inquiries and complaints about these and other similar pests every year, and our correspondents cannot be answered merely by quot

ing a few lines from some text-book or bulletin. There must be some actual studies made, with special reference to our own State, and to this end Mr. Z. P. Metcalf, Assistant Entomologist, is engaged in making various observations and experiments.

Aside from recording all complaints from farmers, making notes on the localities from which they come, etc., the Assistant Entomologist has made the following special studies and observations during the past two years:

Tobacco Flea-beetle.—Special studies were made in Granville County in the spring of 1907, demonstrating the efficiency of arsenate of lead as a remedy in the seed-bed. Treated and untreated halves of the same bed showed marked difference in favor of treatment. Further experiments should be made to prove its efficiency in the field. These studies were made in the spring of 1907, during the last few weeks of Mr. Woglum's term of service with us.

Tobacco Insects in General.—Special studies were made in Granville County in the fall of 1908 to determine which pests multiply on the suckers or shoots from the stubble after the crop is harvested, this in order to ascertain the real importance of destroying the old remnants immediately after harvest. Notes were made on all kinds of tobacco insects found at that time. These studies were made by Mr. Metcalf.

Elm Leaf-beetle.—Observations were made on the habits and life-history of this insect in the summer of 1908, in Raleigh, where it was seriously damaging certain large, valuable trees. Experiments were also made looking to its control. These studies were made by Mr. Metcalf.

Army Worm.—The midsummer of 1908 witnessed a serious outbreak of the true Northern Army Worm on the county farm in Durham County. The caterpillars were present in thousands upon thousands and were literally stripping grass, grains and other suitable vegetation, and were in process of migrating from field to field. The outbreak occurred when the Entomologist was absent, but was taken in hand and personally investigated by the Assistant, who gave adequate instructions for controlling the outbreak and made very valuable observations on the occurrence, which was remarkable as being farther to the southeast than any destructive outbreak of this insect heretofore recorded, so far as we know. Mr. Metcalf's studies threw interesting and important light on the subject.

Cabbage Worms.—During the summer of 1908 tests were made in the laboratory of a mixture of Paris green and dry, sifted lime as a remedy for the common and destructive cabbage and collard worms. It was found that 1 ounce of the poison to from 1 to 1½ pounds of lime is an excellent remedy when applied in light dusting applications from a thin muslin or cheese-cloth sack. During the fall this mixture was tested quite extensively in a market garden in the edge of town with entirely satisfactory results. Such a simple remedy as this is greatly needed, as it is equally as good, and far simpler to prepare and apply than the complicated mixtures containing resin, soap, molasses, etc. Mr. Metcalf will prepare a circular for publication on this subject during the winter.

House Fly.—During the latter part of fall and early winter of this year (1908) studies have been made of the common House Fly, which, as a universal and unmitigated nuisance, is worthy of more than contemptuous notice. That it is *one* of the important agencies in the spread of typhoid fever seems to be established beyond contradiction. It is worthy of note that one city of our State (Asheville) has actually launched into a definite campaign against

the House-fly nuisance, and the efforts of the energetic sanitary inspector (Mr. L. M. McCormick) are meeting with deserved success. Mr. Metcalf, who conducted the studies here at Raleigh, has prepared a circular on the subject which is now in the hands of the printer.

Gloomy Scale.—This scale insect is a serious enemy of certain varieties of maples, and as a shade-tree pest in our State is of rapidly growing importance, not only in cities, towns and villages, but in farmyards and groves as well. During the past four weeks complaints of its ravages have been made from Raleigh, Rocky Mount, Fayetteville, Red Springs (Robeson County) and Speed (Edgecombe County). Studies are now (December, 1908) under way by Mr. Metcalf to ascertain which varieties seem most liable to attack (and which ones exempt), and also to test remedies for its control.

It must be remembered that *investigation work,* while requiring exact technical knowledge and accuracy, cannot be expected in all instances to yield immediate results. It has taken many years for agriculture to attain the rank as a scientific business which it now occupies. The scientific studies which have wrought this change yielded their results slowly but surely. So, in these studies many observations are made and notes recorded which seem trivial, but which are essential to the final accumulation of a comprehensive knowledge of our insects and insect pests. Our investigations of injurious insects have been aimed mainly at essential points in the life-history of the insects studied, and the remedies for them. We have not indulged in prolonged technical studies of biological points of little or no value.

CORRESPONDENCE.

The letter-files of this Division bear testimony to the freedom and increasing frequency with which the citizens of the State call on us for aid. This may be briefly and adequately shown by the following table:

Year.	Number of Personal Letters Written (Approximate).	Number of Circular Letters Sent (Approximate).
1907	1,071	2,147
1908 (to Nov. 15.)	1,502	4,648

Most of this work is attended to by the Entomologist in person, but during times of his absence it is attended to by the Assistant. The correspondence covers every conceivable subject in connection with our work, and while it includes nearly every State in the Union, and some countries abroad, the great bulk of it is among the people of this State, in whose interest the office was created and is maintained. We believe it an indication of confidence that among our most active, interested and frequent correspondents of to-day are farmers, fruit-growers, nurserymen and others, with whom we have had dealings and correspondence continuously for six or eight years.

PUBLICATIONS.

Through its publications this Division is put in touch with thousands whom it does not and could not otherwise reach. We could wish for more progress in our publication work, but with the mass of other duties it is difficult to make rapid headway. The accomplishments in this line may best be shown by the following table:

Year.	Monthly Bulletins of Agricultural Department.		Circulars of Division of Entomology.	
	Number.	Total Copies.	Number.	Total Copies.
1907	2	70,000	2	4,000
1908 (to Nov. 30.)	2	70,000	3	9,000

The monthly Bulletins from the State Department of Agriculture were on the following subjects:

May, 1907, "San José Scale and Remedies."
June, 1907, "San José Scale in North Carolina."
January, 1908, "Bee-keeping in North Carolina."
June, 1908, "Insect Enemies of Cotton."

The circulars of the Division of Entomology were on the following subjects:

Circular No. 20, "The Codling Moth."
Circular No. 21, "Erroneous Reports of Cotton Boll-weevil."
Circular No. 22, "Regulations Governing Nursery Trade in North Carolina."
Circular No. 23, "Orchard Inspection, 1907."

Special, "How Nurserymen May Control San José Scale."

Several other publications are now in preparation.

COLLECTIONS.

From the time of taking charge of this work, over eight years ago, your Entomologist has steadily followed the plan of accumulating as complete a collection as possible of all the insects known to exist in the State. This work is, of necessity, done irregularly, and often many weeks elapse with almost no work being done in this line. There is, however, a broad field for usefulness here if we but had the time and material. In addition to a complete general reference collection for the office there should be—

1. An exhibit of *common and conspicuous species of insects* in the State Museum as a stimulus to teachers, students and others, who make the Museum a place of study and research.

2. An exhibit of the *injurious insects of the State* in the Museum, to be arranged for the convenience and instruction of the farmer.

3. An exhibit of the different poisons, insecticides, etc., used in combating insects, and kinds of spray pumps, etc., used in this work. This exhibit should be in the Museum.

4. A condensed exhibit of the most common, conspicuous, and important insects to be shown at the several district fairs of the State. At other times to be kept in office or Museum.

5. Separate collections, representative of the typical insect life of the different parts of the State, as for the mountain region, the coast region, the sandhill region and the red-clay piedmont region.'

Gradually we are accumulating the materials which may ultimately be used in this work. Our reference collections are now as good as any south of the Potomac and east of the Mississippi, and I hope we may continue to improve in this respect as in the other lines of work of the office.

Whoever is sufficiently interested to notice, will see from the facts here presented that the work of this Division not only covers a wide field, but that it is increasing in volume. In every line of work discussed the tables show an increase in 1908 over 1907, this due to better organization of work, and the efficiency and industry of the Assistant, Mr. Z. P. Metcalf, and of the Inspector, Mr. S. C. Clapp, to both of whom my thanks are due for their patient, unselfish and untiring labors.

Respectfully submitted, FRANKLIN SHERMAN, JR.,
Entomologist.

REPORT OF HORTICULTURIST.

December 14, 1908.

HON. W. A. GRAHAM, *Commissioner of Agriculture.*

DEAR SIR:—I take pleasure in herewith presenting the report of the Division of Horticulture for the years 1907 to 1909.

HORTICULTURAL CORRESPONDENCE.

The work of this office is largely confined to the answering of numerous letters that aim to give any desired assistance or information on all phases of fruit or vegetable culture, harvesting and marketing. In the last two years the correspondence of this division has largely increased. A large part of the time for office work is taken up in giving information on horticultural subjects. I recognize in this a valuable indicator in pointing out the horticultural needs of the State, and in thus directing the policy of this division. There is never much to show for office work but ever-increasing letter-files, but we believe that the spreading of horticultural information throughout the State is a very valuable work, and we therefore give considerable time to it.

TEST-FARM WORK.

In order to thoroughly and accurately work out the problems of the fruit and truck growers in the different parts of the State, the Board of Agriculture has established test farms to experiment with the problems that are every day confronting the farmer. These test farms are located so as to represent the different agricultural and horticultural districts of the State. The Pender farm, which is located on the Atlantic Coast Line Railway at Willard, Pender County, is in the trucking region of the State, and was located primarily for the working out of the truckers' problems. The Edgecombe Test Farm, located at Kingsboro, in Edgecombe County, represents the northern coastal plain region of the State. The Iredell Test Farm, located at Statesville, in Iredell County, represents the agricultural and horticultural interests of the piedmont region of the State. In the mountains in Transylvania County, at Blantyre, is located one of the mountain farms, on which the most important work is the testing of the commercial culture of apples in the mountain regions and also the growing of heavy truck, such as is produced in the mountains. To further work out the mountain problems, a second farm has been established in the Swannanoa Valley, at Swannanoa, Buncombe County, which is devoted to general farm practice for the mountains, with the addition of lands devoted to the culture of mountain truck. The Division of Horticulture is represented on all these farms, and the horticultural work on them is planned and the experiments performed under the direction of the State Horticulturist.

LETTUCE CULTURE.

On account of the suitability of the soil of the Pender farm for truck-growing, a steam plant has been installed for the growing of lettuce in winter. This consists of a 60-horse power boiler and steam pump, with the necessary piping for heating and irrigating the lettuce beds. Water is supplied from

both shallow and deep wells. A tank has also been erected for water supply for heating and irrigating. This work began three years ago with a half-acre of lettuce, which has now increased to 2¼ acres. The following experiments are now in progress: first, wide *versus* narrow frames; second, new *versus* old land; third, variety test of head lettuce; fourth, use of lime; fifth, methods of controlling lettuce diseases; sixth, fertilizer tests; seventh, methods of packing and marketing.

In comparing wide and narrow frames, the narrow frames have given considerable advantage in earliness. The high backs of the narrow frames seem to give a greater capacity for intercepting and retaining the sun's rays. The narrow beds have been best for forcing by steam heat, while the wide frames have given the best results where forcing was not practiced. In the new land which had been cleared from the forest, the results the first year were not so good as on beds which had been placed on old, worn land which had been increased in fertility by the use of legumes, manure, and commercial fertilizers.

Fifteen varieties of head lettuces were grown in test for comparative yields. The old Big Boston variety still holds its supremacy. Very careful and extensive notes have been taken on the methods of controlling diseases destructive to the lettuce crop. These notes have not been fully completed, but the method that has so far proved most effective is the removal daily of diseased plants as soon as they appear and before they have sufficiently developed to infect the soil with disease spores.

As many as 128 fertilizer tests have been under comparison. Various combinations were made to test the amount of fertilizers the lettuce crop would stand without injury and what would be the profitable limit of commercial fertilizer applications. The best results were obtained by the use of a high-grade fertilizer analyzing:

Phosphoric acid.....9 per cent Nitrogen .....7 per cent Potash .....5 per cent	}	Two tons per acre.

In methods of marketing tests have been made of the use of paper liners and caps in lettuce baskets to keep the lettuce fresh and clean, and to prevent it from drying out and wilting in transit. The liners gave the best results in cool weather and were found to be useful in shipping fall lettuce. In the spring shipments, especially during warm spells, they caused the lettuce to heat and rot, so that they are not used now except in cool weather.

Before the lettuce crop was marketed preparations had been made for the cucumber crop which was to follow on the same land. Thousands of cucumber plants were started in paper and terra cotta pots for setting in the frames as soon as the lettuce crop was off. This gave a profitable use for the land and also afforded data as to rotations for quick-profit truck crops. The scope of this work is gradually being widened, and in connection with the lettuce crop we are endeavoring to work out the rotations of truck crops best suited to make use of the residual fertilizers from the lettuce crop. Besides the cucumber crop, we have been experimenting with onions, beets, snap beans, Irish potatoes, and, in a tentative way, with celery, cauliflower and Brussel sprouts. Besides obtaining data on the culture of these crops, the commercial side of their culture is by no means neglected. From 1¼ acres of lettuce last

year the crop was sold for $1,500. The revenue thus obtained assists very materially in paying for the experimental work in progress on this farm.

An agreement has been entered into with the National Department of Agriculture for the conducting of irrigation experiments in truck crops. Through the co-operation of the National Department it has been made possible to sink a deep well on this farm and to further install equipment for the carrying out of an extensive system of experiments in the irrigation of truck crops. Work in this line has been in progress but one season.

On the new test farm at Swannanoa, a series of experiments have been started to test the growing of heavy truck commonly produced in the mountain regions. Some of the best land on this farm has been put in condition, and this last year tests were carried on as follows:

Irish potatoes	4 acres.
Cabbage	1 acre.
Tomatoes	¼ acre.
Cantaloupes	1 acre.
Watermelons	¼ acre.
Snap beans	¼ acre.

Potatoes have been harvested and have yielded a good crop of clean, smooth, marketable potatoes. The cabbage crop did exceptionally well and yielded about ten tons of first-class cabbage. The tomatoes and snap beans also did well, but though good data was obtained they did not prove profitable in a commercial way, as they were, at that season, found to be difficult to market. The cantaloupes did exceptionally well and sold for good prices. This is the first truck work that has been carried out on this farm, and it will be increased in future as circumstances seem to warrant.

PECAN WORK.

In many parts of eastern North Carolina pecan trees have been found producing large and profitable crops of fine, edible nuts. It has occurred to me that if this can be done on single trees at many different points, that it could be done also commercially. In order to demonstrate this work and to find out the varieties of pecans best suited for growing in this State, methods of their culture and fertilization, I have had plantings made on each of the test farms. Variety plantings of all named varieties of pecans obtainable have been made on each of the test farms except in the mountains. We have at present 22 varieties growing on the Pender farm, Edgecombe farm and the Iredell farm. In addition to the testing of varieties, acre blocks of the best commercial varieties of pecans have been planted on both of the eastern test farms. The trees have been set 40 feet apart with peach trees set at 20-foot distances as fillers. From these plantings we expect to learn a great deal about the varieties of nuts most suited for growing in this State and also to test the range of culture of the pecan and the localities in the State best suited to it. This work has been planned on a broad, comprehensive scale, and additions are being made to the plantings every year. I have visited all the States which are producing pecan nuts commercially, and we have now on our test farms in this State the largest and most comprehensive test of pecans in the United States.

ROTUNDIFOLIA GRAPES.

A co-operative agreement has been entered into with the United States Department of Agriculture for the growing and testing on a large scale of all available varieties of the muscadine or rotundifolia type of grade. This is one of the most promising native fruits grown in the South, because it nearly always bears a crop and is little subject to disease. Up to this time very little has been done towards discovering the best varieties and working out the best means of propagating, trellising, cultivating and fertilizing. Twenty acres have been set apart on the Pender Test Farm for this work, and part of the vineyard has been out two years and has made a very fine growth. We have on this farm a variety collection obtained by the explorers of the United States Department of Agriculture. These are growing in nursery rows and are varieties collected from Texas on the south to Virginia on the north. This experiment with rotundifolia grapes is the largest of its kind in the country.

PEAR EXPERIMENTS.

The piedmont clays of North Carolina are especially adapted for the production of pears. There is one very serious drawback in the commercial culture of pears, namely, the destructive ravages of the Pear Blight. In order to study this disease and means of controlling it, we have established on the Iredell Test Farm a four-acre orchard of pears. This is made up of the best commercial varieties, especially those which are hardy and disease resistant. This orchard has made a fine growth and is now large enough for fruit production. Owing to danger of infection from an old orchard on this farm, which was badly affected with blight, I had the old orchard removed so that there would be no danger of the young orchard becoming infected. The trees in the young orchard have made a fine growth and are in excellent fruiting condition. A careful watch has not yet revealed the slightest beginning of blight. To keep the trees growing slowly and render them less susceptible to the disease, the land about them has been seeded to grass. This has formed a good sod, and will restrict the growth of the trees and make them more resistant. We have reason to hope that this method will prove practicable for the culture of the pear in the piedmont regions.

COMMERCIAL APPLE CULTURE.

The special soil and climatic conditions of some parts of the State offer splendid possibilities for special large commercial horticultural industries. No better example of this can be found than the wonderful natural adaptation of our mountain regions for apple growing. Any one who has seen the magnificent fruit produced in the high, cool altitudes of the Brushy and Blue Ridge mountain regions cannot but be impressed with the splendid possibilities of these regions for commercial apple growing on a large scale. Competitive exhibitions have shown that our western mountain apples rival and even surpass those grown in the much-lauded apple regions of New York and Massachusetts. In spite of these opportunities many of the owners of these fine apple lands are not alive to these possibilities in fruit growing and are growing apples in a desultory way, and without attention, for local markets alone. To put the apple growing of the western part of the State on a commercial basis we have started an active propaganda there in commercial orcharding.

On the Transylvania Test Farm, at Blantyre, a small commercial orchard of 500 trees has already been planted to experiment in this line of work. Other land has been cleared on this farm, and if other arrangements are not made, additional planting will soon be put in. To further encourage the commercial production of apples I have, in co-operation with the Division of Entomology, inaugurated a series of demonstration meetings to illustrate the proper pruning, spraying and packing of apples. These meetings were held in all the principal apple-producing sections of the State. The interest taken in these demonstration meetings was very gratifying. The following is a brief synopsis of the work at one of these meetings.

Meetings were not held in the courthouses or in halls, but right out in the orchard where the demonstrator could actually do the work and have the trees to illustrate what he was talking about. The demonstration proceeded about as follows:

1. The speaker took his audience through the orchard and noted the best forms of trees for commercial orcharding.

2. The audience picked out a tree which they desired to see pruned.

3. The speaker outlined the method of growth of trees and explained the reasons for pruning.

4. Explanation of the origin of fruit buds and their development.

5. Pruning tools of different kinds shown by the speaker and examined by the audience.

6. The speaker slowly pruned the tree, explaining as he worked the principles of pruning and the why and wherefore of each step.

7. Comparison of the pruned and unpruned trees.

8. Demonstration of how to properly remove a limb and treat the resulting wound.

9. Pruning of different kinds of trees. For example, apple, pear, peach, plum, etc.

10. Demonstration was given of the pruning and training of a young tree.

11. Methods of renovating old and neglected trees.

12. Tools were distributed to the audience and the pruning of trees by the audience under the direction of the speaker.

13. Answering questions.

The orchards in which the demonstrations were given were selected beforehand on account of convenient and central location. The trees used in the demonstration were generally near the road, where they could be under observation throughout the season so that the results of the demonstration could be noted.

In the fall at apple-picking time demonstrations were given on the proper packing of apples to put them in the most attractive condition for the best markets. These demonstrations attracted a good deal of attention and afforded an excellent means of showing the advantages of the pruning and spraying done at the spring meetings. The fruit was picked from the sprayed trees, and the audience had an opportunity of comparing it with that from the unsprayed trees. It was then carefully packed and put in shape for the best markets. The growers in whose orchards the work was done are fully convinced of the value of spraying their trees and properly packing their fruit. I am satisfied that this is the most important work that has yet been done by the Division of Horticulture. A great deal of attention has been attracted to it and requests are coming in as to where barrels, boxes and other packing

materials can be obtained in order to put up fruit in the best form for shipping to the best markets. In order to further encourage the work, I have promised the growers in whose orchards the meetings have been held that if they will spray their fruit and properly pack it in barrels, I will guarantee to market it for them. If funds are available it is hoped to very greatly extend this valuable demonstration work.

FRUIT GROWERS' ORGANIZATIONS.

In order to further encourage fruit growing and to get in closer touch with the producers of apples, we have organized in two of the principal apple districts local fruit growers' organizations. These organizations are at present doing good work and their meetings, which are held quarterly, are helping very greatly to encourage the planting and proper handling of apple trees. We have promised these organizations to supply them with speakers for their meetings, and at each meeting some definite subject relating to apple culture is taken up. The work is of a very practical nature, the meetings are usually held in the orchard, and endeavor is made to make the work as simple and as useful as possible.

INSTITUTE WORK.

In connection with the regular Farmers' Institute work the State Horticulturist gives a month to six weeks' time to this work every year. During the last two years almost every county in the State has been covered in horticultural work and addresses given on fruit growing and trucking as the necessity seemed to demand.

BULLETINS PUBLISHED.

During the last two years three bulletins have been published on horticultural subjects. They are as follows: "Lettuce Growing in North Carolina," "Commercial Apple Culture in Mountain Regions," "Varieties of Fruit for Growing in North Carolina." Each bulletin covers one definite horticultural subject. The bulletin on lettuce culture was published in answer to many requests which came in from the eastern part of the State regarding the commercial culture of lettuce. The bulletin takes up all phases of the work and is designed to give detailed instructions in all phases of lettuce production. The bulletin on mountain orcharding takes up all phases of this subject and is designed to give definite information to intending orchard planters. This bulletin has attracted a good deal of attention and many calls have been made for it from other States. The variety bulletin is the result of several years' collection of data on the behavior of varieties in different parts of the country. It has been compiled from former records of this department in addition to observations made in the last two years, and also from hundreds of letters sent out to fruit growers in all parts of the State.

Respectfully submitted, W. N. Hutt,
State Horticulturist.

REPORT OF DEMONSTRATOR.

MAJ. W. A. GRAHAM, *Commissioner of Agriculture.*

DEAR SIR:—In submitting to you this the first annual report of the Division of Co-operative Experiments, it affords me pleasure to state that the first year of the work has been very satisfactory. Being a new division, created just a year ago, we have had to plan the work for the various crops and sections into which we have gone.

Starting last fall with alfalfa, where it was deemed advisable to try that crop, crimson clover, vetch, and, this spring, with staple crops, as corn and cotton, we have been able to enlist several hundred co-operators in the work. The reports that have already come in and that are now coming in indicate a widespread interest in the work.

The first reports were from the crimson clover and vetch, which in many instances were planted in neighborhoods where neither crop was before known, and, by the use of inoculated soil from the test farms, proved in many instances to be a success, most of those reporting expressing themselves as desirous of giving these crops still further tests.

The later reports, which are now coming in, concerning corn and cotton seed sent out, while none of them record phenomenal yields, are of a very encouraging nature.

It is a well demonstrated fact that the seed is a potent factor in crop production, as is also method of cultivation, fertilization, etc. With this data in hand, the Demonstrator gets the farmer to co-operate in testing improved seeds, different methods of cultivation and fertilization, and compare the results with the crops made in the same field with the seeds, cultivation, etc., formerly used. Often the results are very striking, and the work is so very plain and simple that it readily appeals to any one making the test.

The corn sent out last spring was the variety known as Cocke's Prolific. Under some conditions the native corn with which this was tested gave better yields than the Cocke's Prolific, yet most of the reports that have come in show the Cocke's to be a better and heavier yielding corn than the native corn with which it was tested. It is my purpose to follow up the varieties that have given a better yield than the Cocke's and get enough of each variety to give them a test upon our test farms, hoping that we may find a better corn than we already have.

The cotton sent out—King's Improved, Simpkins' Prolific, Early Triumph and Cook—are all bringing in good reports, and, so far, the reports show they made more cotton per acre than the varieties with which they were tested.

During next year I purpose increasing the number of co-operators in the work and have it extend over a much larger area than it covered this year.

In addition to the above-mentioned crops and work with farmers, a new line will be inaugurated next year, from which I am expecting fine results. This feature will be the "Boys' Corn Contest," for which the Board of Agriculture appropriated $100, to be given in prizes of $50, $30 and $20 to the three boys making the most corn on one acre of land. This will be open to the boys of the State living on the farm, and under proper regulations furnished by me.

In addition to the prizes offered by the board, I am hoping, through the county superintendents of public instruction, to interest enterprising business men in the various counties in the State in the contest in their respective counties, and induce them to make up a purse and offer prizes for the boy contestants in their respective counties, regardless of whether they get the premiums offered by the Board of Agriculture or not.

By this method we are hoping to so interest the boys of the State in the corn contest as to warrant us in making an increased appropriation after this year. In many States the boys' corn contest has become quite a feature and is interesting boys in corn growing, and in agriculture generally, as perhaps they could be interested in no other way. The farm boys of North Carolina are worthy of as much consideration as the boys of any other State.

Very respectfully submitted, T. B. PARKER,
Demonstrator.

BIENNIAL REPORT OF THE CURATOR OF THE MUSEUM.

MAJOR W. A. GRAHAM, *Commissioner of Agriculture.*

DEAR SIR:—The date of the Curator's last biennial report, viz., December, 1906, practically marked the beginning of the period in which museum work proper had to give place to work preparatory to the Department's participation in the Jamestown Exposition. This exposition work has been covered in a report made by your Curator to the North Carolina Jamestown Exposition Commission, the salient points of which are reproduced here.

JAMESTOWN EXPOSITION WORK.

Under agreement made between the Executive Committee of the Exposition Commission and the Commissioner of Agriculture, the Secretary of the Board and the Curator of the Museum representing this Department, the Department of Agriculture took hold of the matter of making an exhibit in the divisions of Agriculture, Horticulture, Forestry, and Fish and Game, the commission supplying the funds therefor from the State appropriation. The date at which authority was given to start on this work was so late that everything had to be done hurriedly, but by pushing things we had our exhibits completed and in good shape as soon or sooner than the majority of those in the building in which we exhibited. The space occupied was a rectangle, covering 3,000 square feet of floor space, with aisles all around, an ideal location. This space was railed-in by a polished brass railing, supported by heavy square posts, each post being surmounted by a flagstaff carrying a blue silk banner, with lettering thereon to the following effect: "Exhibit of the North Carolina State Board of Agriculture." At each corner and at the center of each of the longer sides were entrances six feet wide, and each entrance was flanked by Ionic columns of tasteful design, surmounted by gilded eagles. Festoons of bronzed peanuts in varied colors ran between all flag poles and columns. The general color design was cream and gold, with the State colors worked in. Over the center of the exhibit hung a large North Carolina flag, while smaller silk flags were used decoratively all through.

About the center of the space a small house, about twenty-three by ten feet in size, was built, the interior of which was used for office and storage purposes, while the exterior was decoratively treated in agricultural products of varied kinds. It was a very artistic piece of work and attracted much attention and favorable comment.

In front of the house the space was symmetrically filled—circulating space being, of course, provided between them—with an arrangement of plain tables and tables with four-foot-high superstructures built on. The sides of the latter were covered with red denim, and on this background were arranged in artistic decoration small, neat bundles of all the principal grains, grasses and forage crops of the State, of a high quality. On the tops of these superstructures were sheaves and pyramids of wheat, oats, rye, timothy, orchard grass, clovers, etc., and the edges were decorated with small bunches of wheat heads.

The flat tables were used for the display of horticultural products in the fresh state—strawberries, dewberries, cranberries, plums, peaches, pears, cherries, apples, cantaloupes and watermelons were shown fresh, with cabbages,

potatoes (both sweet and Irish), turnips, beets, etc., in the vegetable line. One watermelon shown weighed 100 pounds even.

A pyramid opposite one of the corner entrances showed both agricultural and horticultural exhibits. Jars of preserved fruits were around the lower shelf, and back of them ran a series of four-foot glass tubes containing grains and seeds. All these were well set off against a rich background of red denim. Above were arranged other jars of fruits, preserved in fluid. Topping the whole structure was an umbrella-shaped canopy, the rim of which was treated with bronzed peanuts in portière effect.

Opposite the other corner entrance at this end of the exhibit was another pyramid, the lower part of which contained thirty-two large colored transparencies of scenes illustrating the agricultural, horticultural and industrial features of the State. The interior of the structure was well lighted by incandescent bulbs, so that the colors and lines of the pictures showed up fine and clear, even on the brightest days. On dark or dull days the effect was exceptionally fine. Above the transparencies there was an exhibit of wines made from native grapes, while topping the whole a tall, tapering column, with Ionic capital, reached to the rafters of the building, twenty-three feet above the floor. This column was decorated with tobacco, in both leaf and granulated form.

One table, near the most frequently used entrance, held the register for visitors, and on it was also arranged supplies—renewed as needed—of a great variety of literature, advertising and illustrating the natural resources of the State and its cities and counties. Whenever for any reason sufficient supplies of perishable horticultural products to fill all the tables devoted to this purpose failed to come in on time, the tables assigned for displaying this class of material were used temporarily for a display of photographs illustrating the State, its features and industries.

West of the house were the exhibits in Forestry and Fish and Game. The Forestry exhibit was very complete and was acknowledged by all to be the best Forestry exhibit made by any State at the Exposition. The various native forest trees were represented by both cross and longitudinal sections, finished and polished so as to bring out the beauties and characteristics of the grain of the wood. Probably fifty species of native trees were shown. The longitudinal sections showed the width of the tree, with bark attached, and the same applies to the cross sections. A series of transparencies showing typical forest scenes occupied an elevated structure in the center of this part of the exhibit, and these, too, were lighted from behind by incandescent globes. A very complete collection of native forest seeds was a feature of this part of the exhibit. Crude block of ivy (kalmia) and rhododendron roots, as gotten out for the manufacture of "brier-root" pipes, were shown, together with specimens showing the various stages of manufacture from the crude root to the finished pipe. An exhibit of handsome veneers, in quartered oak, sycamore and black walnut, showed the possibilities of these woods for high-grade furniture and piano work.

The principal feature of the Game exhibit was a large case, in which were shown, among natural surroundings, a collection of the different species of wild fowl found in the State. This case had a beautifully painted background and contained a specimen of the male and female of practically all of our native wild geese and ducks. Other specimens occupied space along the tops of this and other cases. The game and fur-bearing animals were shown in cases flank-

ing this one and included such native animals as bear, opossum, raccoon, wild cat, beaver, otter, red fox, gray fox, mink, red, gray and fox squirrels, etc. A fine collection of both raw and dressed furs occupied an adjoining case.

Fish were shown mostly in the form of colored pictures, mounted and framed, some few being exhibited preserved in glass. Oysters, clams, escallops, blue crabs, stone crabs, shrimps, etc., were shown, both in glass and canned. A series of five handsome models, built to scale, of the principal types of fishing vessels and boats used in the State's commercial fisheries were exhibited, these being arranged along the tops of the cases containing the natural-history and game specimens.

The whole of the above exhibits, as stated before, were made by the Department of Agriculture, through its own salaried officers. The exhibits were designed and made by the late T. K. Bruner, then secretary of the board, and myself. The money appropriated for this purpose by the North Carolina Commission to the Jamestown Exposition was not available early enough for much new material to be collected and prepared in some of the lines exploited, and the Museum had to be drawn upon largely in making the display. It may be mentioned here that a large part of the exhibits in the Department of Mines and Mining was also drawn from the Museum. A larger and finer exhibit could have been made had more money been available and that earlier, but the late date at which the Legislature made the second appropriation, as well as other causes, precluded this. As it was, the collective exhibit was accorded a great deal of praise, and it was undoubtedly the cause of making our great natural resources along the lines exploited much better known than ever before, to our own people no less than to outsiders.

Mr. T. W. Adickes, Assistant Curator, acted as an efficient assistant during a part of the exposition. Your Curator was in direct charge practically the whole of the time, as Mr. T. K. Bruner's absence in Europe on immigration work, and later, his illness, precluded his taking the active part he otherwise would have done.

The total amount of money turned over to the Department of Agriculture's officials by the Exposition Commission was $8,200, about a thousand dollars of which was put into cases and exhibits that have since come to the Museum as permanent improvements.

The number of diplomas and medals awarded this exhibit will give some criterion of its excellence, as it appeared to the jury of awards. They were as follows: Gold medals, 13; silver medals, 21; bronze medals, 14; a total of 48 awards.

North Carolina was also honored by representation on the exposition jury of awards. Among those accorded this honor were Mr. R. D. W. Connor, Secretary State Historical Commission; Prof. P. P. Claxton, late of the State Normal College; Prof. Edwin A. Alderman, late of the University of North Carolina; Dr. Charles Baskerville, late of the University of North Carolina, and the writer.

MUSEUM WORK.

But little in the line of preparing or collecting new Museum material was possible from December, 1906, to June, 1908. This period covers the time in which the Curator and his assistant devoted the greater part of their energies to exposition work. Practically the whole of 1907 was given over to this, and most of the time from the end of 1907 to June, 1908, was taken up in unpacking

and reinstalling the exhibits used at Jamestown in the Museum. However, during the spring of 1908 the Museum force put in such time as could be spared in collecting and preparing quite a lot of natural-history material, and this work has been vigorously pushed during the six months just ended.

It can be readily seen from the above that the period covered by any exposition in which the Department participates cannot be one of much growth for the Museum. But in connection with this it must be noted that the close of one of these expositions always brings to the Museum a large amount of new material and cases; so it is not a losing game, by any means, in the long run.

During the time in question the general routine work of the Museum was carried on as usual, and the correspondence was also given its proper attention. The latter was handled from the Exposition during the stay of the Curator there, and during that time short visits were made to Raleigh at frequent intervals to give personal attention to such Museum matters as demanded it, and to see that things were working smoothly and in good shape.

This exposition made fewer demands on our collection than such affairs usually have done and, in consequence, the condition of the Museum during that time was much more satisfactory than it had ever been before under like conditions. The ideal condition will have been reached when we possess such duplicate collections in all divisions as will allow the making of any exhibit away from home without the necessity for withdrawing anything from our exhibit series here. Material carried about in this way, packed and unpacked four times for each display made—to say nothing of the exposure and traveling stresses—deteriorates materially in many lines, and this kind of treatment calls for much labor and expense in repairing and renewing. The offset to this, apart from the exhibit value of the specimens while on display at an exposition, is the value of the new material and new cases that the Museum always acquires on these occasions.

Generally speaking, the Museum has gone forward in all lines during the period under discussion to a marked degree. It is now larger, better kept, more attractive and better patronized than ever before, and the one object of its officials is to spare no pains to not only maintain its present degree of excellence, but to force its growth, both in quantity and quality. Its power for good as an object-teaching educational institution is great, and our one aim is to add to its value as such in every possible way.

It may be well to remark here that a new fireproof building is a vital necessity for the proper safeguarding of our many valuable specimens. No amount of money could replace much of our material, in case of destruction by fire, and it would take years of hard work and a good deal of money to again get together the greater part of the collections that could be replaced. It would be strictly in the line of economy to spend a good round sum on such a building now, rather than run the risks of a devastating fire any longer.

Respectfully submitted, H. H. BRIMLEY,
Curator.

FINANCIAL STATEMENT.

DECEMBER 1, 1906, TO NOVEMBER 30, 1908.

Balance in Treasury December 1, 1906		$ 1,366.77
RECEIPTS FROM SALES TAGS—		
December 1, 1906, to November 30, 1907		108,719.03
December 1, 1907, to November 30, 1908		116,906.53
Total		$ 226,992.33
DISBURSEMENTS—		
December 1, 1906, to November 30, 1907	$ 110,441.63	
December 1, 1907, to November 30, 1908	114,991.89	
Total		225,433.52
Balance in Treasury December 1, 1908		$ 1,558.81

SUMMARY OF DISBURSEMENTS FOR THE LAST TWO FISCAL YEARS, ENDING NOVEMBER 30, 1907, AND NOVEMBER 30, 1908.

Distribution.	1907.	1908.	Total for Two Years.
Attorney's fees	$ 200.00	$ 200.00	$ 400.00
Board and Committee meetings	1,200.25	930.20	2,130.45
Salary Commissioner	2,754.20	3,250.00	6,004.20
Salary Secretary	1,800.00	1,800.00	3,600.00
Salary Registration Clerk	1,439.99	600.00	2,039.99
Salary Bulletin Clerk	900.00	900.00	1,800.00
Salary Private Secretary	680.00	780.00	1,460.00
Wages night watchman	687.33	720.00	1,407.33
Wages engineer	720.00	840.00	1,560.00
Wages servants	750.00	840.00	1,590.00
Inspection	3,710.33	4,535.84	8,246.17
Tags and paper	5,923.74	9,276.51	15,100.25
Printing Bulletin, etc.	4,830.81	6,967.52	11,798.33
Postage, express, freight and incidentals	2,733.23	3,135.98	5,869.21
Heat, light and water	1,415.52	1,480.27	2,895.79
Subscriptions	49.00	56.30	105.30
Furniture and fixtures	----------	67.71	67.71
Traveling for Commissioner	----------	61.20	61.20
Building and repairs	324.38	841.41	1,165.79
Test farms	10,839.43	9,821.55	20,660.98
Farmers' Institutes	4,837.81	6,457.50	11,295.31
Soil survey	4,000.00	----------	4,000.00
Special appropriations	1,333.17	2,215.26	3,548.43
Fairs	1,195.00	1,136.35	2,331.35
Immigration	2,004.03	1,061.10	3,065.13
Interest and payment of college notes	17,342.47	9,360.84	26,703.31
Division of Horticulture	3,608.27	5,058.23	8,666.50
Division of Entomology	5,977.82	5,536.54	11,514.36
Division of Botany and Biology	500.35	----------	500.35
Division of Veterinary Science and Quarantine	6,111.68	8,823.92	14,935.60
CHEMICAL DIVISION—			
Salaries	13,429.65	15,920.00	29,349.65
Apparatus and reagents	2,663.30	2,489.75	5,153.05
Traveling	400.00	400.00	800.00
Books and periodicals	156.23	161.41	317.64
Stamps and stationery	332.55	400.00	732.55
Telegrams, freight and incidentals	430.74	495.06	925.80

SUMMARY OF DISBURSEMENTS—*Continued.*

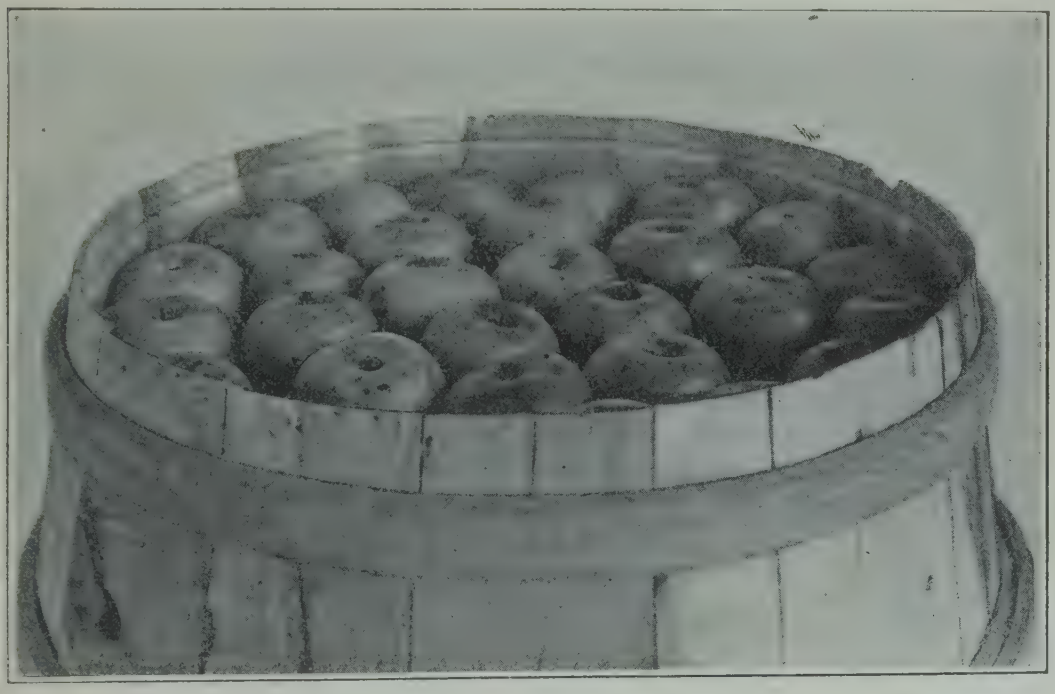
Distribution.	1907.	1908.	Total for Two Years.
CHEMICAL DIVISION—*Continued.*			
Furniture and repairs	$ 180.75	$ 175.45	$ 356.20
Food work	170.88	243.41	414.29
Soil work	1,000.00	1,368.93	2,368.93
Co-operative experiments	----------	2,425.18	2,425.18
STATE MUSEUM—			
Salary Curator	1,800.00	1,800.00	3,600.00
Salary assistant	600.00	660.00	1,260.00
Salary usher	480.00	480.00	960.00
Wages servant	336.00	360.00	696.00
Current work	692.72	700.00	1,392.72
Hall of History	----------	158.47	158.47
Grand totals	110,441.63	114,991.89	225,433.52

HANDLING THE APPLE CROP.

By H. Harold Hume, Horticulturist.

INTRODUCTION.

There is no region in the United States where better apples can be grown than in the mountain region of western North Carolina. The fruit is unsurpassed in appearance, in color, in edible quality and in keeping quality. Their keeping quality is unsurpassed if rightly handled, but too frequently they receive such treatment and reach the market in such condition, so covered with spots and bruises, so poorly selected, that they will not keep.



The top of a well-packed barrel of Apples as it opens up in the market.

The natural markets of western North Carolina apples are the towns and cities in the region east and south of the district in which they are grown, yet many of these markets are closed to our apples, because of the way in which they are prepared for shipment, and the way in which they are shipped. Apple dealers in these same cities prefer to send hundreds of miles away to western New York and other apple districts where the growing, picking and packing of apples are well understood, and procure their supply of apples that will keep until they are used, to procuring a near-by product that will spoil on their hands.

These things are not as they should be, and our growers must awake to the fact that, if the apple region is ever to come into the prominence that it

merits—the place that is its own for the taking—the product must be put up in first-class shape, well grown, well picked, well graded, well packed, marketed in inviting shape.

The object to be held in view in preparing any fruit for market is to grow that fruit as nearly perfect as possible and then to put it in the hands of the consumer in all its freshness, as nearly like what it was as it grew on the plant as possible. And to do this, the methods used by many western North Carolina apple growers need to be radically changed.

These changes are necessary for two reasons: first, because it will bring more in money returns to the individual grower, and, second, the reputation of the region as an apple-producing district will receive the credit that it merits.

The object of this Bulletin is simply to contribute some information which may assist in bringing about these essential changes in methods.

WHEN SHOULD THE CROP BE GATHERED?

The time at which the fruit should be taken from the trees depends upon whether it is intended for storage, long-distance shipment, or for immediate use and local consumption, and upon the season of the variety.

The earlier varieties of apples may be allowed to mature fairly well before they are gathered. They should be fully colored and may even have commenced to soften somewhat. To attain full flavor in summer and early fall apples this is necessary. Such fruit, of course, is not intended for storage, nor will it stand long-distance shipment.

Winter apples, intended for cold-storage, should be picked when the fruit is full grown and well colored. Poorly colored and immature fruit will not keep so well as that which has reached its full color and development. If the fruit has to be shipped a considerable distance before going into storage, it cannot be allowed to ripen so much as though it were to be stored immediately. If the fruit is a little too ripe before going into storage, it should be placed in packages smaller than the ordinary apple barrel and each fruit should be wrapped in paper.

If winter apples, good keepers, begin to fall from the trees, the crop should be taken off at once. Maturity in apples is, of course, indicated by the color of the seeds turning from white to light and finally dark brown, and this may be used as a guide to a certain extent; but winter apples should be perfectly hard and firm at the time of picking. All fruit should be gathered before frost falls.

HOW NOT TO PICK.

The fruit should not be shaken from the trees or knocked off the trees with sticks. Some go to the trouble of piling brush or branches around under the trees to keep the fruit from striking the earth and stones beneath. But even then the chances are that the fruit when finally ready for shipment will be of exceedingly poor keeping quality, even though it was in excellent condition as it hung on the trees.

Do not allow the fruit to become bruised. Bruised apples will not keep. The bruises will, in most cases, become rotten spots before any great length of time has elapsed. And herein lies one of the reasons why North Carolina apples will not and do not keep—they are bruised and battered, and in such condition are fit for nothing but drying, cider or the cull-heap. Besides,

bruises materially lessen the amount of apple that is fit for use, and when it is prepared in the kitchen the bruised parts must be cut out and thrown away. Hence, it is plain that in buying bruised apples the purchaser does not receive full measure in edible fruit.

HOW TO PICK.

Apples for shipment, apples to be sold, apples to be kept through the winter for family use, should be hand-picked, and no fruit that has fallen from the tree to the ground should go among fruit intended for any one of the above purposes. The stems should remain on the fruit. If broken out, a small hole is left and an opening into the flesh of the fruit. Into this opening the germs of decay find their way and the apple rots. The picker should ascend the tree and, grasping the apple firmly in his hand, with a slight twist remove it from the twig or branch upon which it grew. It should then be carefully placed in a basket provided for the purpose or in a sack slung about the shoulders.

EQUIPMENT FOR HANDLING THE CROP.

Ladders.—A number of good ladders should be provided. No one ladder will answer all purposes, and at least two types will be found useful.

The stepladder is indispensable. It should be strong, light, provided with a platform, and should have three legs instead of four. A stepladder with three legs is perfectly safe and will stand steady and solid on ground so rough and uneven as to make it impossible to use one with four legs at all. Longer ladders should be made for the taller trees. These should be of sufficient length to reach the tops, made strong and light, with broad rounds. The side pieces should be united or joined together at the top like the letter V inverted (Λ). The ladder can then be shoved up among the branches when necessary. It may also be used by laying it flat against a small number of small branches on the outside of the head of the tree.

Picking Utensils.—For gathering the fruit, strong wooden baskets holding about one-half bushel are very convenient. An iron hook should be attached to the handle, to be used in hanging the basket to a branch or the round of a ladder. A good hook can be made from a piece of half-inch round iron eight or ten inches long. This should be bent like the letter S and attached to the basket handle by means of a leather strap four or five inches long, having a hole cut in each end.

A sack made from an ordinary flour or grain sack is also good. The sack may be spread open with a piece of stick, sharp-pointed at both ends, placed in one side of the mouth, thus making the mouth of the sack triangular. Place a small stone in the lower corner of the sack, tie a piece of stout twine about it as it lies in the corner and then tie the twine to the center of the side of the sack mouth opposite the stick. This draws the bottom and top of the sack together, leaving an opening through which the arm may be thrust and the sack slung over one shoulder.

Fruit Pickers.—Sometimes it is difficult to pick the fruit from the uppermost branches. A number of implements provided with long handles have been made for removing apples from such places. One of these will often be found very convenient.

Barrel Headers.—In packing the fruit the barrel must be filled full. When this is done, it is difficult to put the head in place, and a header of some sort must be used.

[PLATE 1.]

A good way to spoil good apples in taking them to market.

A poor way to haul good apples. The apples are in open boxes and there are no springs on the wagon.

A very good header may be made at home. Take a piece of two-inch plank, twelve inches wide and four feet long. To one end of this firmly spike a piece of two-by-six-inch plank a little longer than the height of the barrel. In the upper end of this piece of plank a slot is cut, holes bored through from side to side and an iron pin placed through them. A lever about eight feet long is then procured. On the under side of this lever, about two and a half feet from one end, spike a piece of two-by-four-inch scantling one foot long. To the under side of this piece of two-by-four nail a piece of circular board nearly the size of the top of the barrel. To place the head in the barrel it is set on the base plank, the end lever is inserted in the notch under the pin and the head is gently but firmly pressed into place.

Headers worked with a screw such as are shown in Plate 5 are very convenient and useful. Two pieces of flat iron are so bent at the bottom ends as to hook around the bottom edges of the barrel. These are held together by a cross-piece at the top, through which the screw works.

Wagons.—For hauling empty barrels the wagon should be provided with a large rack.

For barrels filled with apples a particular type of wagon will be found very convenient. The wheels should be low and the trucks should be so arranged as to turn in a short space. The bottom should be made of plank and sufficiently wide to hold just two rows of barrels. The length should be sufficient to make it possible to take from twelve to sixteen barrels at a load.

In getting fruit down from steep places a sled or stoneboat should be used. If a single wagon is used for hauling fruit in open boxes, such as shown in Plate 1, it should by all means be provided with springs.

PACKING THE FRUIT.

Barrel Packages.—The package which has been most commonly used up to the present time for apples is the barrel.

The standard of size is not uniform throughout the apple regions.

The New York law calls for a barrel with "head diameter seventeen and one-eighth inches; length of stave twenty-eight and one-half inches; bulge not less than sixty-four inches, outside measurements."

The Missouri barrel is as follows: "Length of barrel twenty-eight and one-half inches, with chines of three-fourths of an inch at the ends; the diameter of the heads shall be seventeen and one-fourth inches and the diameter of the center of the barrel inside shall be twenty and one-half inches."

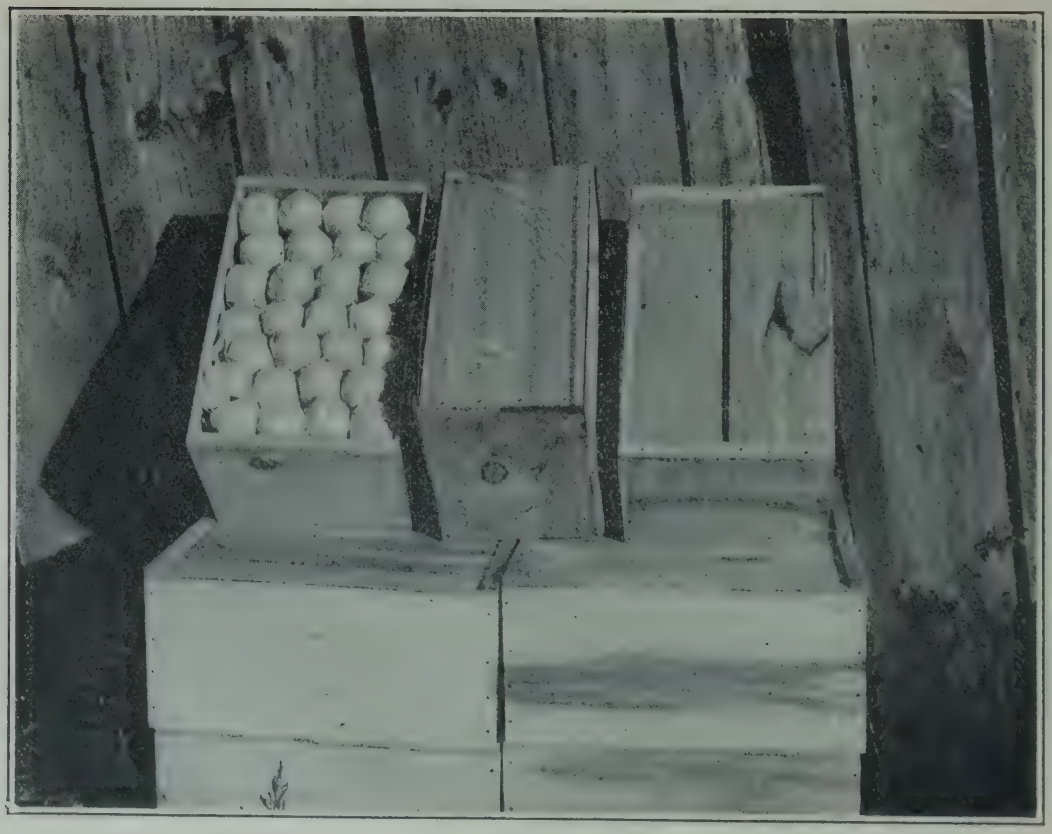
The Canadian barrel for export apples is required by law to be "twenty-six inches and one-fourth between the heads, inside measurements, and a head diameter of seventeen inches, and a middle diameter of eighteen inches and one-half, representing as nearly as possible ninety-six quarts."

The barrel recognized by the National Apple-shippers' Association is seventeen and one-eighth inches in diameter of head and twenty-eight inches in length of stave and bulge not less than sixty-four inches, outside measurement.

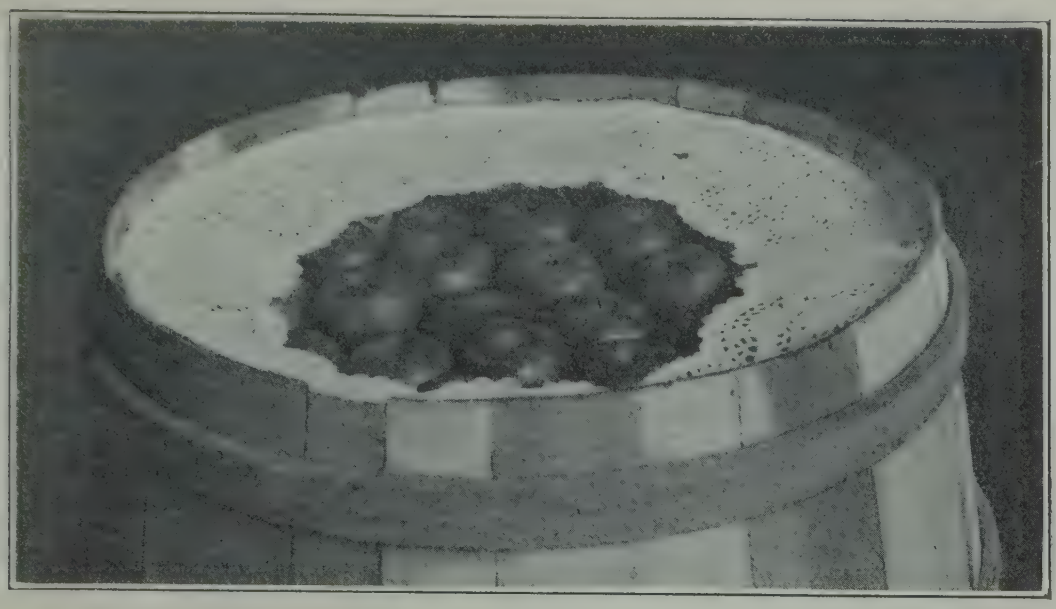
The barrel commonly used in North Carolina is sixteen and one-half inches in diameter of head and twenty-eight and one-half inches in length of stave, with bulge sixty-four inches, outside measurement; containing eleven pecks.

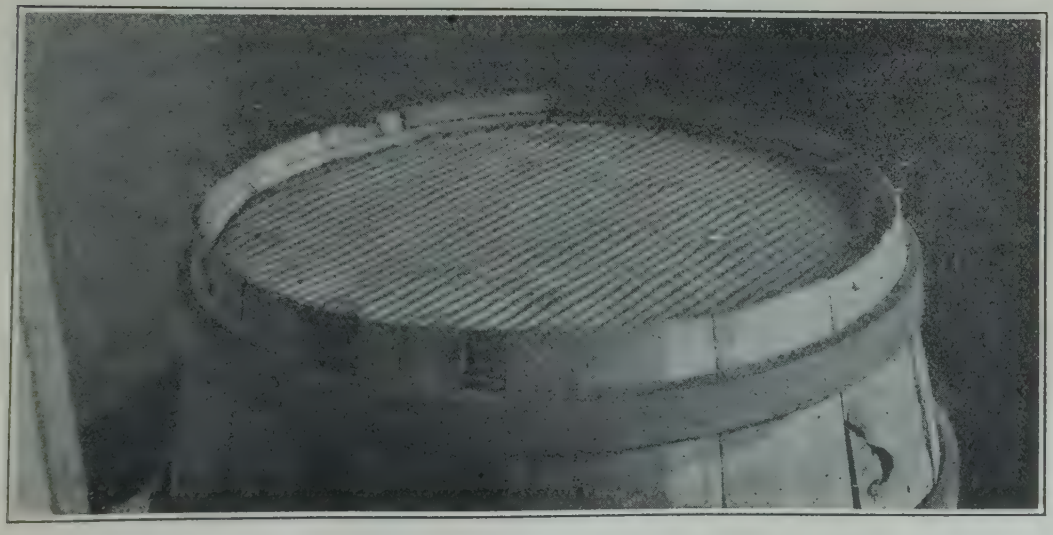
The barrel should be well made, clean, neat and attractive. The statement is sometimes made that "the package sells the fruit." While this may not

York Imperial Apples boxed for export.
(Courtesy Bureau Plant Industry, U. S. Dept. Agr. Negative by S. H. Fulton.)



Winesap Apples wrapped and packed in boxes.
(Courtesy Bureau Plant Industry, U. S. Dept. Agr. Negative by S. H. Fulton.)





Fancy paper used in trimming barrels of fancy apples—Winesaps in this case. In the lower figure is shown the corrugated cap, the best thing for putting in the heads at time of packing.

be strictly true, still the package, making, as it does, the first impression, favorable to the product or unfavorable, has much to do with disposing of its contents.

Under no conditions should the barrel be undersized; it should give full measure as determined by law or the custom in the region from which the fruit comes.

Packing Houses.—While a shed may be used, or a regular packing house may be constructed for the work of packing, still this may be dispensed with and the fruit may be packed in the open orchard. As the fruit is picked it should be piled in the shade of the trees and there packed. Picking tables constructed with ordinary carpenters' horses and a few boards will be found very convenient. These may be picked up in pieces and moved from one part of the orchard to another as desired.

Box Packages.—In recent years the apple box has been brought into prominent notice. As yet no standard of size has been fixed, though the aim has been to get the fruit into bushel or half-bushel boxes.

The box has a place; it has come to stay. The tendency has always been, in all lines of merchandising, toward the smaller or individual package. It is not many years since shoes, for instance, were shipped to the local dealer packed loose in old trunks or boxes, and the buyer had to rummage through the lot for what he desired. Now each pair of shoes (except the inferior grades) is packed in a box by itself. So in fruit handling, the tendency is toward the smaller package.

The strong point in favor of the box is that it suits the needs of the small housekeeper. Many hesitate to buy a barrel of apples who would be glad to get the same material in a smaller package.

But the box should not be used for anything but strictly first-class fruit; it will not pay to pack inferior or even ordinary apples in a box. The boxes should be neat and attractive, inside and out—the best that can be produced in every respect, package and contents.

Apple Crates.—The crate is an abomination, the certain destruction of the keeping quality of apples. The fruit is bruised and injured through the cracks. The fruit does not usually fill the crate, at least not when it arrives at its destination. It rolls about and is injured still further. *Do not use crates.*

Grades.—Three grades are sufficient, or rather two grades and the cull-heap. I believe it best to follow the standard of size as determined upon by the National Apple-shippers' Association, and their remarks on quality are quite in place.

The standard of size for No. 1 apples of large varieties, such as York Imperial, Stayman, Rome Beauty and Ben Davis, is set at not less than 2½ inches in diameter. The standard of size for No. 1 apples of the smaller varieties, such as Winesap, Jonathan and Bonum, is not less than 2¼ inches.

All No. 1 apples should be practically free from wormholes, bruises, breaks in the skin, of good color, well grown and hand picked.

No. 2 apples are those which are not less than 2¼ inches in diameter. The fruit must be free from bruises and breaks in the skin. The size of No. 2 apples of the smaller sort has not been fixed, but two-inch diameter apples might be included.

The stems should be in all first-class apples, or in at least 85 or 90 per cent of them, and the specimens in a lot of this kind should be uniform in size, color and appearance.

If some fruit is very much larger, it may in some cases be advisable to select these and pack them by themselves. It does not look well to see very large and medium or small apples placed together in the same package.

It is easier to define a first-class apple than it is to find one, easier to define a strictly first-class barrel of apples than it is to secure them. Yet, if well packed and carefully graded as to size, a number of second or even third-rate apples may be found included in a first-class package. But in any barrel of first-class apples at least 75 per cent of the fruit should be strictly No. 1. All of them, however, should be in such shape as to keep well.

To illustrate the point further: the barrel shown on page 61 was a first-class barrel of apples. In Plate 4 are shown two samples which were selected from it. Those at the top were strictly No. 1 Newtown Pippins—perfect, smooth, free from specks, spots or blemishes. The sample of five specimens below, from the same barrel, were not perfect by any means. The left-hand specimen shows the work of the codling moth at the blossom end, while the upper right-hand specimen had a small hole or puncture on the left of the stem. In the lower row the left-hand apple was badly eaten by a caterpillar which destroyed a considerable area of the skin, and a small hole shows above the blossom. The center specimen was cracked on the end while the right-hand one had a worm-hole right through the side. Yet a number of such specimens may be admitted and the barrel pass as No. 1. But it is well to bear in mind that a preponderance of such varieties would place it in class No. 2.

The grading should be rigid. It pays to do it, and the larger the crop and the lower the price the more rigid should the grading be to secure the best possible price for the crop.

Grading.—The fruit may be graded as it is packed. Two barrels should be set up—one for No. 1s, the other for No. 2s—and as the fruit is picked over, each class finds its way into its respective barrel.

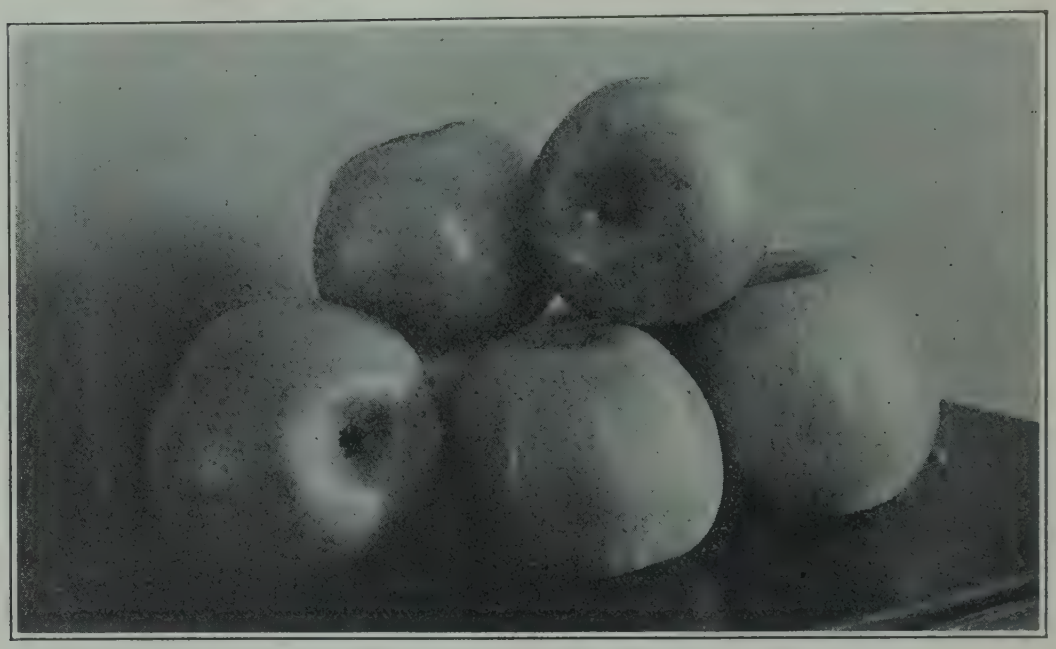
In some cases it may be necessary to put the apples into the barrels, carry them to the packing house, the grading to be done later. Generally speaking, however, the grading should be finished up as the fruit is put into the barrels in the orchard.

Packing.—The barrel should be placed on a solid foundation, preferably on boards or planks, and not on the grass or soft ground. The bottom end of the barrel in packing is supposed to be the top end when the packing is finished; in other words, the barrel is supposed to be opened up in market by taking out that end. This is not always the case, however. The buyer opens the other end instead, to determine what sort of a pack the grower has put up.

But at any rate the bottom end (in filling) should be faced. Before putting in any apples, however, a few layers of nicely-folded newspapers should be put in the bottom. Better still are the corrugated apple-barrel caps. This protects the fruit from bruising and keeps it in perfect shape in the head of the barrel.

Then face two rows. Facing does not mean that the best specimens should be placed in the end of the barrel. Not at all. The fruit in the ends should represent and be the same as that in the center and all parts of the barrel. In other words, *the barrel should be absolutely uniform*, ends, center, top,

[PLATE 4.]



Specimens of first-class Newtowns as taken from a barrel of No. 1s. These are fine apples.

Newtowns from No. 1 barrel. These are all second-class apples at least. They show wormholes, cracks and breaks. See text.

bottom, all alike. The stem ends of the fruit are turned downward and the layer is snugly packed in, placing each specimen by hand. Then a second layer covering the spaces left between the apples in the first, stem ends also downward. The barrel is then ready to be filled up.

For filling the barrels, a small basket, one that will go down into the barrel, and provided with a swing handle, will be found very convenient. This basket is filled with fruit, let down into the barrel and turned over, allowing the fruit to run out. Continue this until the barrel is filled. Shake it down thoroughly from time to time so as to settle and pack the apples in the barrel. *Under no circumstances* should the fruit be poured from the chines of the barrel and allowed to fall upon its companions below. Bruising would result.

The barrel should be filled up until the fruit stands about three-quarters of an inch above the chines. Level off carefully and it is ready for the head. (See Plate 5). A covering of newspapers or, preferably, a corrugated apple-barrel cushion, should then be placed on, followed by the barrel head (see Plate 3). Then the barrel press is placed in position (Plate 5) and the head pressed into place and nailed there.

For export apples it is sometimes advised that the fruit be placed in by hand in layers, each layer being pressed firmly but gently into place.

In packing boxes each fruit should be placed in position by hand. The fruit should be wrapped and the box lined with paper (see Plate 2).

The rule for quantity in any package is to get into it all the apples it will hold; then they will not shake and rattle about.

Stenciling.—As soon as the package is closed up it should be properly marked. The box should be marked on both ends, while the barrel should be marked on the faced end. It should bear the name of the variety, the grade of apple, whether No. 1 or No. 2; the name of the grower and the place where grown.

PACKING DON'TS.

Don't mix varieties, apples of different shapes and colors, in one package.

Don't mix windfalls with hand-picked apples.

Don't pack bruised, badly worm-eaten or partly decayed fruit. Consign it to the cull-heap; it will pay better there; it will do more for the reputation of the region there than it will in the market.

Don't put up a snide package.

Don't put all the good apples in the ends of the barrels and poor fruit in the centers. The buyer is not fooled, or at least not more than once, by this practice.

Don't put your name on inferior packages.

Don't handle apples as though they were stones. Instead, handle them like eggs.

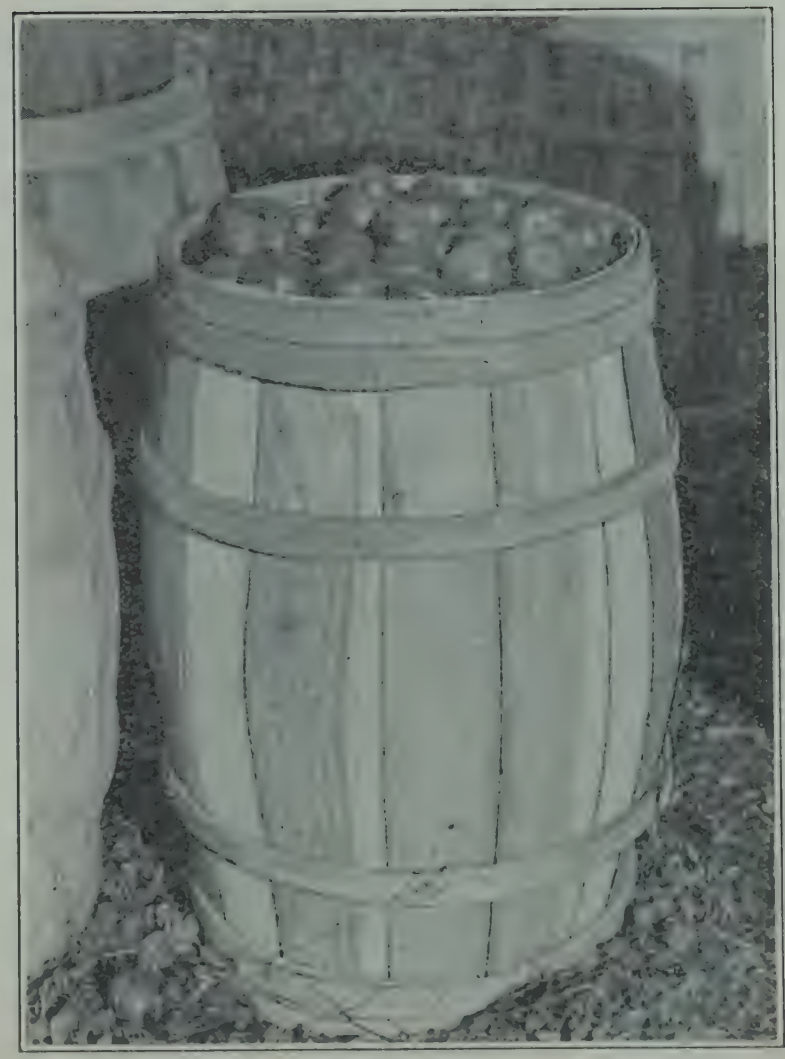
PRACTICES WHICH SHOULD BE DISCARDED.

There are three common practices in the apple section of this State which must be strongly condemned. These practices are ones which convert good apples into poor ones, good apples into rotten ones.

The first is picking the fruit by shaking it or knocking it from the trees. This results in bruised fruit, in fruit of poor keeping quality. No one who appreciates the nature of an apple will resort to it.

The second is the hauling of the fruit to the railway depot or place of sale loose in a wagon box. This, too, results in bruises innumerable.

Putting the head in place. Note the press, and the cushion just under the barrel head at the right.



Barrel of apples ready for the head.

The third is the shipping of apples simply thrown in loose in cattle and box cars. Such treatment will ruin any fruit and spoil the reputation of any apple section. *Ship only in boxes or barrels, well packed as directed, carefully headed up and placed in box cars so that they will not roll about.*

WILL IT PAY TO PACK FRUIT RIGHT?

Yes. The writer stood at the station at Waynesville, N. C., about a year ago now and watched a wagon-box load of apples being placed loose in a box car, or perhaps a few bins had been partitioned off in the car, which was just as bad. The grower was getting 35 cents a bushel at the car.

Another grower who picks his fruit carefully, grades it well, and puts up a good package, was asked about his prices. After counting up the cost of picking, the cost of grading, packing and barrels, it was found that the same grade of fruit, no better, was bringing him, net, 65 cents per bushel. More money in his pocket—nearly twice as much—and he was doing his full part in building up and maintaining the good name of western North Carolina apples.

PICKING, PACKING AND STORING APPLES FOR HOME USE.

The complaint is often made that apples do not now keep like they used to keep. I do not believe the fault lies in the fruit, but is due rather to the inroads of the arch enemies of the apple—scab and codling moth. (Plates 8 and 9.) There is no known means of controlling these except by spraying. And apples which have been sprayed at the proper seasons, three or four times during their growth, will almost invariably outkeep those which have not been sprayed. Therefore, the spray-pump should be called into use long before the fruit is ready for packing.

Apples intended for home storage should be carefully hand-picked and rigidly selected. Any specimens not strictly perfect should be discarded, to be used immediately.

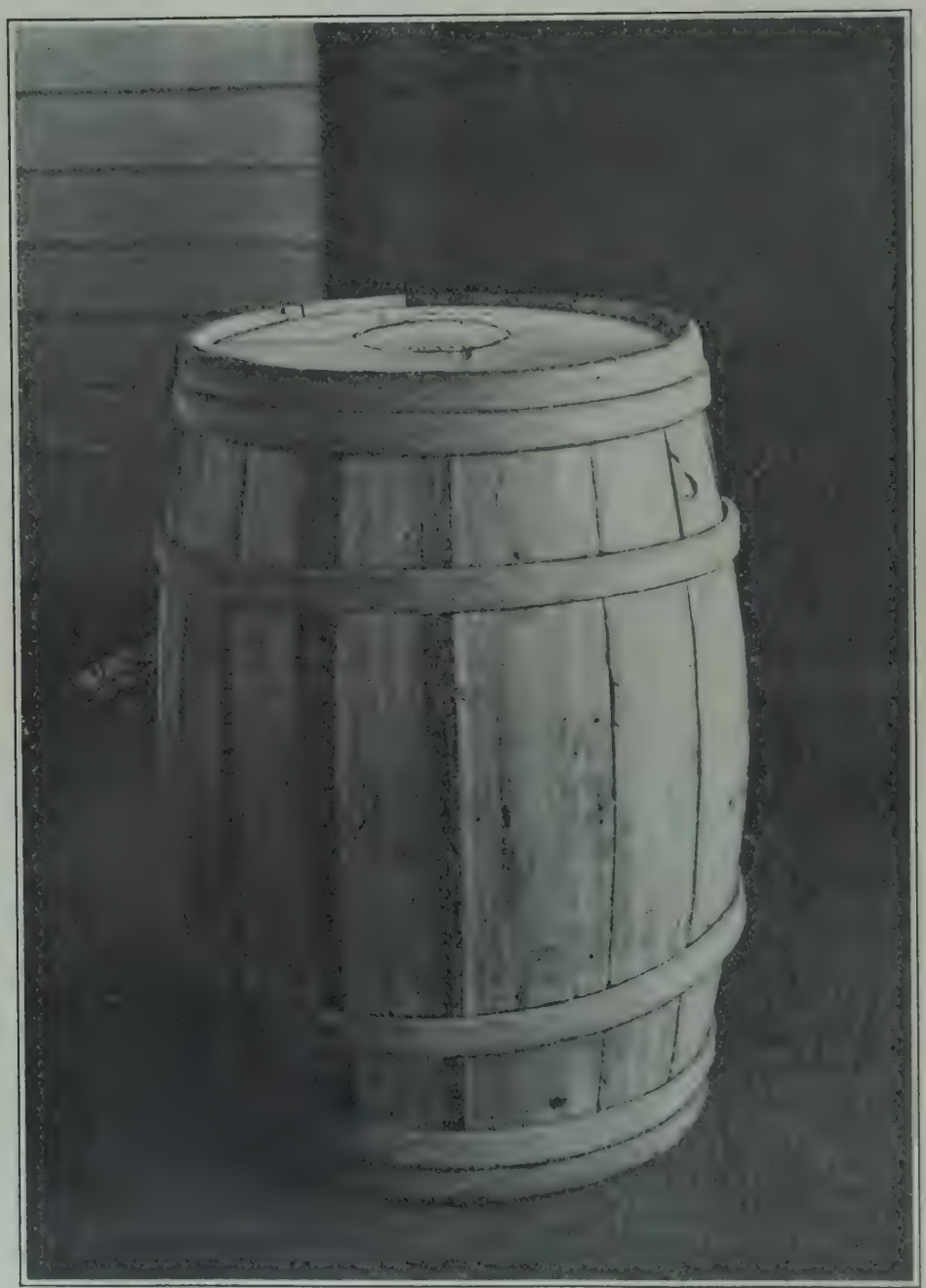
A sufficient quantity of old newspapers for wrapping the fruit should be secured. Wrap each apple in a piece of paper and place the fruit in boxes. They should not be covered up, but simply left open. These should be set away or stored in a cool, dark place. The air should not be too dry, and the nearer the temperature is to the freezing point the better.

It may be well to examine the fruit from time to time, but fruit picked, wrapped and stored in this way will outkeep that which is simply left in an ordinary barrel, open or headed up. The great advantage in the paper-wrapping is that it prevents the fruit from drying up and shriveling, and if one specimen decays, germs of decay do not readily spread to the adjoining fruit.

MARKETS AND MARKETING.

The natural markets for western North Carolina apples are the towns and cities of North Carolina, South Carolina, Georgia, Florida, southern Alabama, Mississippi and Louisiana. It is doubtful whether Louisiana towns should be included, as the all-rail freight rates are so high that in this respect our growers cannot hope to compete with water rates from different points in Arkansas, Missouri and other States. The shipment of our apples north of the Virginia line is almost entirely out of the question, unless intended for export, as the region north of that line is amply able to supply its own needs, and again the question of freight rates must be considered. But the region

[PLATE 6.]



The finished barrel, well packed, stenciled, ready for shipment.

or States mentioned above is not an apple region; it does not produce by any means enough to supply its own demands, and in much of it no apples whatever are grown.

[PLATE 7.]

The Apple Pen—a poor way to keep good apples.
(Negative by H. P. Gould. Courtesy of Bureau of Plant Industry, U. S. Dept. Agr.)

In this region, too, population is increasing rapidly, and we are bound to see still greater increase. Manufacturing enterprises are rapidly developing, and manufacturing towns offer good inducements to fruit producers. These are the reasons why these are our markets. We are nearer to this section than any other apple-producing region, and should be able to take and hold these markets. Much depends upon the quality of the output and how it is prepared for market. The result lies entirely in the hands of the growers, provided they are dealt with fairly in the matter of freight rates.

To enumerate some of the cities which should receive special attention, we have the following list:

North Carolina.—Wilmington, Charlotte, New Bern, Raleigh, Goldsboro and many others.

South Carolina.—Charleston, Columbia, Spartanburg.

Georgia.—Atlanta, Savannah, Augusta, Macon, Brunswick, Columbus and Rome.

Florida.—Jacksonville, Tampa, Pensacola.

Alabama.—Birmingham, Montgomery and Mobile.

Mississippi.—Jackson, Vicksburg.

Louisiana.—New Orleans.

These are not only centers of consumption; they are also centers of distribution; they supply much of the surrounding country, the smaller towns and villages.

Marketing.—The best plan is to get in touch with apple dealers or commission men in some of these markets and get them to handle the fruit. Either ship to them on consignment or sell to them outright. Pick good, reliable men; send them good material, treat them squarely, and you will receive like treatment in return.

APPLE SHIPPERS' RULES.

The following suggestions from the National Apple-shippers' Association* will be found to contain many valuable hints:

Standard Barrels.—Resolved, That this Association recognizes as the standard barrel for apples a barrel which is of the capacity of a flour barrel, which is 17⅛ inches in diameter of head and 28½ inches in length of stave, and bulge not less than 64 inches, outside measurements. (Adopted August 1, 1895. Amended August 6, 1897.)

Requirements for No. 1 Apples.—Resolved, That the standard for size for No. 1 apples shall not be less than 2½ inches in diameter, and shall include such varieties as the Ben Davis, Willow Twig, Baldwin, Greening, and other varieties kindred in size. That the standard for such varieties as Romanite, Russett, Winesap, Jonathan, Missouri Pippin, and other varieties kindred in size, shall not be less than 2¼ inches. And further, that No. 1 apples shall be at time of packing practically free from the action of worms, defacement of surface, or breaking of skin; shall be hand-picked from the tree, a bright and normal color, and shapely form.

Requirements for No. 2 Apples.—No. 2 apples shall be hand-picked from the tree; shall not be smaller than 2¼ inches in diameter. The skin must not be broken or the apple bruised. This grade must be faced and packed with as much care as No. 1 fruit. (This rule, determining what a No. 2 apple shall be, was made a by-law of this Association Aug. 3, 1900, and appears among the by-laws.)

Barrel Legislation.—Resolved, That the State vice presidents be directed to prepare proper resolutions, urging the enactment by their respective State Legislatures of legislation making the legal barrel for apples conform to the package adopted by this Association—that is, 17⅛ inches head and 28½ inches stave, with bulge not less than 64 inches, outside measurement. (Adopted August 2, 1895. Amended August 6, 1897.)

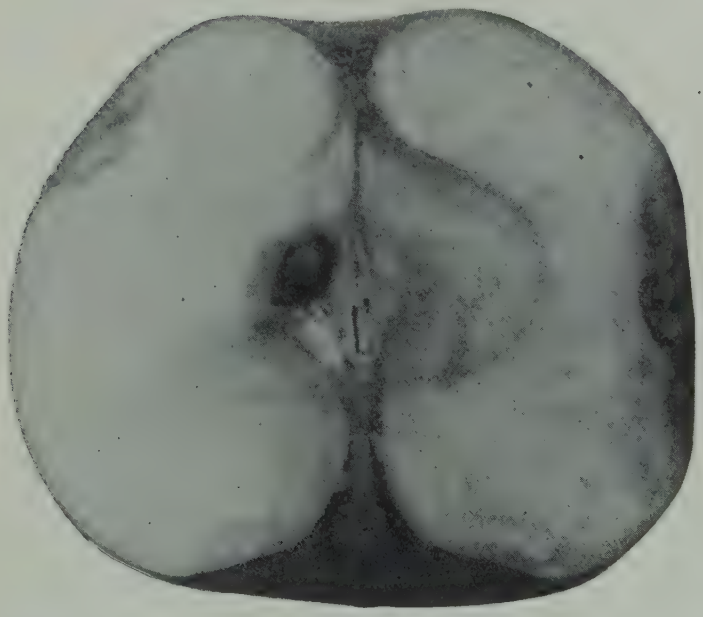
Transportation Necessities.—Resolved, That this Association strongly urges the necessity and fairness of the adoption of a uniform weight of 150 pounds for a barrel of apples as a basis of rate thereon, and directs the new transportation committee of this body to immediately take steps to urge the acceptance of such weight on the part of the rate-making committees of the railroads. (Adopted August 6, 1897.)

Resolved, That the transportation committee be directed to secure from the transportation companies a regular bill of lading instead of the "Shippers' Loading and Count" bill of lading. (Adopted August 6, 1897.)

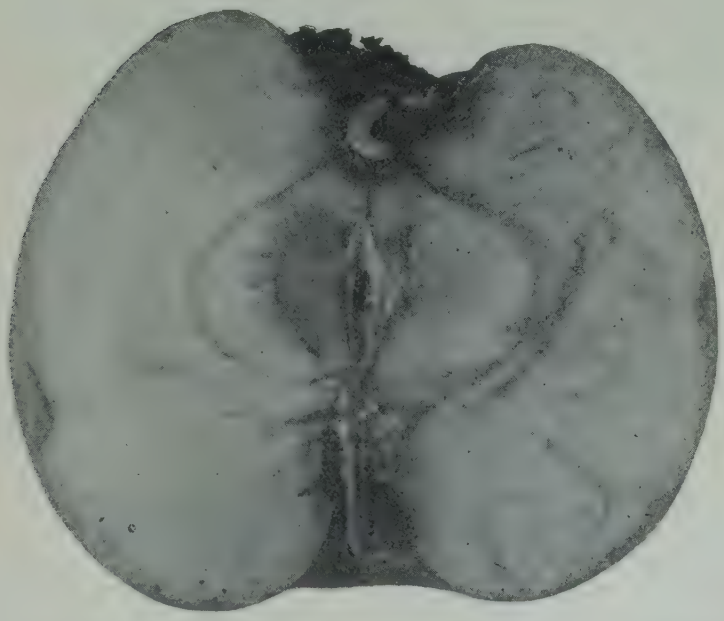
Resolved, That the transportation committee recommends that a vigorous protest be made against present methods regarding claims against transportation companies and the demand that a settlement must be made no later than from thirty to sixty days from the filing of a claim for loss or damage.

*As given by Professor Waugh in Fruit Harvesting, Storing and Marketing.

[PLATE 8.]



The bruised apple. Note the bruises on the right and upper left sides. Such specimens should not be shipped.



The Codling Moth and its work. Both the stem and blossom end have been eaten out. Such apples will not keep.

accompanied by proper proofs, and that sister organizations be requested to assist in the agitation for justice until justice shall be accorded just claimants. (Adopted August 4, 1898.)

Protected During Growth.—The leading agricultural papers of the country are doing a splendid work in directing the attention of fruit growers to the means offered for the detection, location and correction of fungus and other diseases of apples. It is quite within the province of a deliberative body like ours, composed as it is of representative dealers and exporters from different sections of the country, to express its appreciation of the value of the scientific deductions, the practical application of which is doing so much annually toward saving the crops in infected districts from utter annihilation.

[PLATE 9.]

Apple Scab and cracks caused by it in the skin of the apple.

This Association would fail in its duty if it refused to recognize a widespread neglect of the advantage afforded by judicious cultivation and spraying of apple orchards, as recommended by State, county, and district agricultural societies. Fruit growers, especially in the East, must adopt these measures if they expect to retain their hold upon the trade of the country and continue their present position in the apple markets of Europe.

In view of these facts and conditions be it, therefore,

Resolved, That the members of this Association desire to be placed upon record that they will, as far as possible, continue the agitation upon this now most important question of the proper care of fruit during cultivation; and to that end be it further resolved, that copies of this recommendation be forwarded to the agricultural press of the country with a request for the endorsement and publication of such part as may seem to them fit and proper.

COMMERCIAL APPLE CULTURE IN MOUNTAIN REGIONS.

By W. N. Hutt, Horticulturist.

The apple is the most widely distributed of tree fruits. It is found growing on every continent of the globe. In the United States it grows in every State of the Union, from the subtropic to the north temperate zone. It is found from sea level to mountain top, with every variety of soil and with every grade of humidity and aridity. In this wide range it has almost every environmental change to which a plant could well be subjected. Under all these varying conditions it gives evidence of its likes and its dislikes by the varying degrees of success to which it grows.

Plants, like animals, have their preferences and also their means of showing them. The environmental likes and dislikes of plants are easily seen. When they are at home and comfortable in their surroundings they give evidence of their satisfaction in increased growth and production and in the highest quality of fruit. When they are not comfortable they show a puny growth, scarcity of foliage, susceptibility to the attacks of insects and diseases, lack of fruit and lessened longevity.

It is interesting to note the instinctive desires of the apple tree and what conformity it shows to local conditions. In the low altitudes where the cotton plant is at home the apple tree is generally most uncomfortable. Except with the early or summer varieties, it is hard in such locations to keep apple trees in life. After resisting conditions unsuited to them they have little power left for fruit production. In the warm, sandy soils where sweet potatoes grow large and sweet, apple trees lose their leaves and have a struggle for life from season to season. On loamy or clay soils they feel more comfortable, show a correspondingly increased growth and productiveness, are more free from disease and are longer-lived. Observations on apple growing throughout the whole of this country show that the trees require for their best growth, productiveness and longevity the following conditions:

1. Zone ..... Temperate.
2. Climate ..... Summer cool, winter cold.
3. Soil ..... Rich loams and clays.
4. Altitude ..... High.
5. Rainfall ..... Copious and constant.
6. Drainage ..... Good.
7. Sunlight ..... Abundant (air clear and cloudless).
8. Food ..... Constant supply of humus and plant food.

In America the regions that produce the most and best apples are those that afford the largest number of these conditions.

APPLE ZONES.

The temperate zone is the native home of the apple. All around the world it finds its best general temperature for growth in this zone. In the temper-

ate zone it inclines to the north and finds there rather than in the south its best or *optimum* condition of growth. In the south temperate zone the apple deports itself much the same as in the north temperate zone, and inclines to the cooler south rather than towards the tropical boundary. As an evidence of the hardiness of the apple tree and its love for a cool climate it may be unknown to many that most magnificent apples are grown in Canada, away north of the great lakes, on the forty-sixth parallel, north latitude. In this region the lakes and rivers are icebound for several months of the year, the ground in winter is covered with three or four feet of snow and the thermometer is sometimes 30 degrees below zero. In that region the apple is nearing the northern limit of its growth. Considering these extremes of temperature, one would begin to wonder how North Carolina, with its mild climate, could raise apples at all. It does show, however, why apple growing is so commonly unsuccessful in the cotton belt. Being a cool-loving plant, the apple tree finds in the cotton belt its extreme southern limit of endurance. The pecan tree, on the other hand, being a southern neighbor of the cotton plant, will grow and thrive well in the area of cotton production. About one-third of the area of North Carolina is in the cotton belt, one-third rolling piedmont and one-third high and mountainous. It is in this mountainous region of the State, where altitude guarantees a cool climate, that the apple grows and thrives and produces even better than it does in the renowned apple regions of the North.

MOUNTAIN REGIONS FOR APPLE CULTURE.

It is not generally known to apple growers that a mountain region in the South, which by virtue of its altitude affords the same cool temperature that a northern region gives, has yet other advantages that a northern location, with its higher latitude but lower altitude, cannot give. The "Sunny South," particularly in its mountain regions, has the clear air and abundant sunlight that put the rich colors on the outside of the fruit and the fine flavors within. Other things being equal, the greater the amount of sunlight the higher colored the fruit. In regions where cloudy skies are prevalent fruits and also flowers are of dull colors. Clear, sunny weather will give bright flowers and also highly tinted fruits. The maximum hours of sunlight are obtained at high elevations. It is for this reason that mountain-grown fruit is superior in color and flavor to that of the same varieties grown in the lowlands. The best fruit grown in eastern United States is that produced on the slopes of the Blue Ridge and Alleghany Mountains. The most lofty portions of these mountain ranges are found in western North Carolina. Here a rich soil, combined with high elevation, affords almost ideal conditions for commercial apple culture. Very few fruit growers in the South appreciate the splendid opportunities afforded for commercial apple growing in the high, cool, but sunny slopes of the southern Appalachian region. It is only in the last decade or so that fruit growers generally have become aware of the advantages of elevated regions for the commercial growing of hardy fruits. At present, all along the eastern slopes and foothills of the Alleghany Mountains, in Pennsylvania, in Maryland, in Virginia, in West Virginia and in North Carolina, lands which were formerly considered almost worthless for agricultural purposes are now rapidly passing the mark of $100 per acre for commercial orcharding.

DRAINAGE IN MOUNTAIN REGIONS.

Another great advantage of mountain lands for growing fruit trees is that they naturally afford the most perfect drainage. The slope of such lands is almost a perfect guarantee that they are naturally well drained or can be made so at very small expense. Orchard trees of all plants require the most perfect drainage. Since they are perennial, they cannot, like annual crops, occupy the ground only in the favored season of summer, when growth conditions are almost perfect. They must be subject to every prevailing condition of heat and cold and of flood and drought throughout the entire year. Trees placed on wet or undrained land have to resist a condition that is adverse to their growth, and their productiveness and longevity are reduced accordingly. In connection with Experiment Station work I once had charge of an orchard that was on very flat land. This orchard received almost ideal tillage, fertilization and spraying. In spite of the most constant care and attention the trees were unproductive; they shed their foliage prematurely, and not a year passed but some of them died and went to the brush pile. When this orchard should have been at the age of its greatest production and usefulness there was but a remnant of dying trees marking an ill-advised attempt to grow trees in a location entirely unsuited to them. One single circumstance will be sufficient to explain the cause of the utter failure of this orchard: Crayfish would build up their burrows in the soil beneath the trees. A pebble dropped into a burrow could often be heard to splash into water a few inches below the surface of the ground. These trees, as fruit trees always do, naturally refused to grow and produce on a waterlogged soil. In mountain regions, on account of favorable drainage, conditions of this kind are almost impossible.

THE ADVANTAGES OF ALTITUDE IN COMMERCIAL APPLE ORCHARDING.

An apple tree, in its soil and fertilizer requirements, differs little from a forest tree. The conditions of soil that will produce heavy timber will produce productive fruit trees. Forest trees grow naturally on mountain slopes because they find there a rich soil, abundant drainage and clear sunlight. The same conditions will produce large, productive, long-lived fruit trees. Where the natural forest is taken off the mountain slopes by the lumbermen a forest of fruit trees can profitably succeed it. Indeed, no cultivated crop so well holds sloping lands from washing as do the strong roots of fruit trees. The common agricultural trouble known in the South as "washing of land" is only another name for uncontrolled drainage. Trees, since they are perennial in growth and have their roots in the soil at all seasons, are more useful than any other crop in protecting mountain lands from destructive erosion. Sloping soils which will wash must necessarily be well drained. This is the foremost reason why trees like sloping land and why mountain orchards give better results than those in similarly cool locations, but on flat lands with the water table too close to the surface.

The cool but sunny slopes of southern mountains have ideal conditions of soil and drainage that are unexcelled for the culture of hardy fruits. The cool climate of a southern mountain region obtained by high altitude is, for many reasons, better for apple growing than the equally cool but less sunny locations in the North obtained by higher latitudes.

NATURAL IRRIGATION IN MOUNTAIN REGIONS.

It is not only necessary that trees be protected from excessive moisture by drainage, but to insure their best growth and productiveness they must have a copious and constant supply of water during their season of growth, and particularly when they are developing a crop of fruit. If the roots of a tree are immersed in water for any length of time its leaves will turn yellow and drop, and it will cast off its fruit. If this condition becomes chronic, as on ill-drained lands, the roots will sooner or later become diseased and rot off. On the other hand, excessive droughts may leave in the soil so limited an amount of moisture that the tree will show yellow foliage and cast off its fruit as it does on too wet land. As sloping land is a natural corrective for too much water being supplied to trees, it is also a means of furnishing moisture in times of excessive drought. In elevated regions it is often found that moisture precipitated on mountain tops is carried down gradually, so that lower slopes receive from it a copious and constant supply. This is especially true where the soil is more or less mixed and underlaid with rock or shale. The rocks protect the moisture from the sun, and the roughness of a rocky or shaley bed affords a natural reservoir, which gives up its moisture in a slow but constant supply to lower lands. Moisture obtained in this way is known in the irrigated regions of the West as "seepage water" and is used to grow immense fields of wheat in the foothills clustering about the bases of high mountains. This condition is found to a greater or less degree in all mountain regions. In coves and protected places it amounts to a natural system of subirrigation. The slope that in times of flood takes excessive and injurious moisture from the roots of the trees in times of drought brings the life-giving moisture to them. In mountain regions one frequently sees large, healthy trees clinging to rocky crags, where they would scarcely appear to have sufficient soil to cover their roots. Though they have little soil, they have from their location so perfect a system of root aeration, irrigation and drainage that they grow and flourish to perfection. Such natural conditions of drainage and irrigation occur only in mountain regions. It is for this reason, more than any other, that fruit trees in mountain regions are large, vigorous and long-lived.

The late T. K. Bruner, of this Department, in his valuable work on "North Carolina and Its Resources," gives the following note on mountain apple trees:

> The size to which apple trees attain in the mountains of North Carolina is a source of wonder to those who have become accustomed to the trees in the North. In one orchard in Haywood County was measured a tree that had a girth of eleven feet and nine inches, and in the same orchard, which had never been cultivated, there were a hundred other trees that were full three feet in diameter of trunk and all in the most luxurious health. All that is needed here is a population of fruit growers who understand the culture and handling of winter apples. Apples of the northern varieties grown in Watauga County are hardly recognizable because of their greater size and beauty.

AIR NECESSARY TO TREE ROOTS.

Roots of trees require air as well as moisture. If the roots of a tree are fully surrounded by water, air is excluded and the tree dies of suffocation. On ill-drained lands trees have a way of pushing their large roots partially above the surface of the soil, so that they can get the air necessary for their growth. The cypress, which grows in tidewater, sends up its knees above high-water mark, so that it can get its air in time of flood. The roots of trees, even under

the most favorable circumstances, do not go nearly so deep into the ground as is commonly supposed. Their home is between the water table and the surface. As to how commodious a home the tree roots have will depend on how much living room there is between the water table and the surface. The orchard in which the crayfish made their burrows had too cramped a layer of aerated soil to support vigorous tree life. Trees which make the maximum growth are those which have a deep water table, with a retentive but well-aerated soil above it. The roots of trees will not grow below the line of permanent ground-water. Of almost all trees three-fourths of the root system is found in the first foot of soil. One is often surprised to find that large trees uprooted by a storm have a much shallower root system than one would have expected. On the other hand, tree roots are sometimes found deep in wells, but on examination it will be found, too, that they adhere only to the air-exposed surfaces. In cities, where filling-in is done to raise the grades of streets, the deeper covering of the tree roots is almost always fatal to shade trees. The same thing is often seen where lumber mills blow out their piles of sawdust about the roots of growing trees. It is not that the sawdust in itself is injurious, but that it suffocates the tree roots by burying them beyond the reach of air.

ATMOSPHERIC DRAINAGE AND FROST PROTECTION.

In mountain regions, besides the draining of water from higher to lower levels, there is a similar drainage of air. This latter might seem to be of trifling importance in fruit growing, but it is in fact one of the most important considerations, for it tends greatly to avert frost. Freezes and frosts are undoubtedly the greatest hazard of the business of fruit growing. No disease or depredator destroys half so many hopes and dollars for the fruit grower as a few hours of frost. We are told that "the frost falleth alike on the just and on the unjust," but in seasons when the daily papers are heralding reports that an untimely frost has taken the entire fruit crop of the State some lucky fellow high up in his mountain coves, with not too many good works to his credit, has his entire crop saved as if by a miracle. Frosts appear to strike in a very erratic manner; they are, however, like other phenomena of nature, subject to very definite laws. It is well known that as air becomes heated it ascends, and as it cools it becomes heavier and falls. On sloping ground air as it cools passes down from higher to lower levels. Other things being equal, low lands are more frosty than higher lands, because the cold and frosty air drains from the higher and settles into the lower levels. A corn field in the fall gives one of the best illustrations of the places most subject to frost and those also which are exempt. On the bottom lands the blades and stalks will almost invariably show where frost has bitten first. Up on the hillsides and higher elevations the corn will often be found growing fresh and green, while in the bottoms below not a green stalk can be seen. Where knolls occur in bottoms they will often be seen to lift their greenclad sides out of the blighting frost-laden atmosphere of the surrounding valley. Air drainage is just as natural as water drainage, and for orchard locations is just as important a consideration.

The frostiest locations, and those therefore to be most avoided, are valleys shut in on all sides. To the uninitiated these places would appear to be most admirably protected, but they are veritable frost pockets. On cold nights they receive the cold air from higher regions, and frosts and freezes in them are inevitable. Once while traveling in the Rocky Mountains I saw one of these small valleys shut in by hills, in which all the vegetation was nipped by frost.

The surrounding hills on one side were somewhat lower than on the other sides. When the valley became full of cold air it flowed over the lowest side, just as water would have done. All around on the other sides of the valley the high frost mark could be seen, and it formed a line on a level with the top of the lowest hill where the frosty air had flowed over. Above this line the tenderest vegetation showed not the slightest injury. A valley with a large outlet will usually be reasonably safe from frost. The land about rivers which have a considerable fall will be drained of water and also of cold air. Lands contiguous to such streams can be counted on as being reasonably safe from frost. Experience with frost shows that mountain regions are much safer for fruit growing than the lower lands below them.

A carefully planned and conducted experiment which I made two years ago in a hillside peach orchard confirms the results of general experience on this point. This orchard was carefully surveyed with a leveling instrument and the ground mapped out in contours. Contour lines connected all trees at the same elevation. There was two feet difference in elevation between each two contour lines. Self-registering thermometers were placed on each contour line and readings were made on them three times a day throughout the entire winter and spring. The lower contour lines almost invariably registered lower temperatures than the higher ones. There was usually from one-half to one degree of difference between each line and the one above it. Instruments placed along one contour line, thus all being at the same elevation, showed practically no difference in temperature. During the winter zero temperatures were recorded in this orchard. At pruning time in the spring it was found that the wood of the trees on the lowest contour had been badly frozen, and was "black-hearted." The effect of the "black-hearting" lessened with higher contours, and on the highest one not a single affected tree could be found. The only fruit produced in the orchard was on the two highest contours. Higher land above this, which was not planted in orchard, would undoubtedly have been a safer location for peaches. The same season an estimate was made on the effect of winter freezing of peach buds on trees grown on comparatively level land. A measuring pole was placed in the trees and by means of a step-ladder the buds were examined and counted at different heights from the ground. An examination of 1,300 buds gave the following percentage of buds killed by frost:

Two feet from the ground	50 per cent.
Four feet from the ground	30 per cent.
Eight feet from the ground	16 per cent.

These are only a few of hundreds of such examples that could be given to show the advantages of elevated locations for fruit growing.

THERMAL FRUIT BELTS.

In mountain regions, where elevations are greatest, the maximum of exemption from frost is experienced. There are many places in our mountains known as thermal belts, which are said to be entirely free from frost. Whether or not this is claiming too much, it is certain that distinct lines can often be seen separating bright, fresh verdure above and blackened, frost-bitten foliage below. Similar lines of demarcation can be seen in spring between the early growth on the hillsides and the dormant buds of the valley below. In summer over the same area can be seen a distinct cloud line marking the height of the fog in the valley below, while above it on the hillside will be a cloudless air bathed in sunlight. In the fall, when frosts have claimed all the tender vegeta-

tion of the valley, there will be seen longitudinal bands skirting the hillsides, showing for a month or six weeks all the freshness of summer. Though the exact borders of these thermal zones cannot be located with precision, their general position is fairly constant. Orchards planted on thermal belts are remarkably regular in fruit bearing. There are many orchards in the mountains where old settlers claim they have never seen a failure in a crop from frost. The reason for these peculiar phenomena is undoubtedly the draining of cold air from the hillsides and its stratification in the valleys below. There are other circumstances connected with thermal belts that have not yet been fully worked out. By the aid of self-registering instruments for recording temperature and humidity we are at present working on these problems, and hope to have information to give later. However, there is at present sufficient practical evidence of the value of thermal belts in frost protection. Fruit growers should not fail, where possible, to take advantage of them in orchard planting.

DIRECTION OF SLOPE.

There is considerable difference of opinion among fruit men as to what is the best direction for the slope of an orchard. The preferences of different men of experience are so variable as to include every point of the compass. Each slope has its advantages and its disadvantages. A northern slope is a little later in forcing growth in spring, and on that account the bloom is less apt to be nipped by late spring frosts. On the other hand, the fruit on northern slopes, when developing, gets less sunlight and does not have the high colors of that grown on southern slopes. As it is the sunlight that paints the bright colors, the southern slopes always produce the richest-tinted fruit. Southern slopes, too, are the ones from which the sun drinks the moisture most rapidly. They are apt, therefore, to be droughty, and unless the trees are well cultivated or mulched they will produce small fruit. On account of the continuous loss of moisture from southern slopes it is found that the soils on them are almost invariably thinner and poorer than on northern slopes. Comparisons in the growths of natural forests on northern and southern slopes bear out the same idea. Western slopes give brighter colors of fruit than eastern ones, but they get the hottest rays of the sun, and trees on them are much more subject to sunscald. By care in cultivation and pruning many of the drawbacks due to slope can be overcome, but in any case the sloping lands are to be preferred to level ones for commercial orcharding.

The steepness of the slope on which it is practicable to plant orchards will depend on circumstances. One often finds apple trees in mountain regions that are producing large quantities of beautiful fruit in places that to a plainsman would scarcely seem to be accessible with a flying machine. There is little doubt about the trees doing well on very steep and even on rocky locations, but it is often next to impossible to harvest the fruit there economically. Mountain coves, even when high up in the mountain sides, offer the best possibilities for apple growing, because they have natural irrigation and excellent drainage, and their soils are usually rich from the washing of the enclosing slopes. Often, while steep, high ridges may be entirely unsuited for apple trees, the coves which they contain may be almost ideal for the same crop. Nature never intended that the greater part of mountain lands should bear anything but forest. Man in mountain regions too often invades nature's realm, and thus we

see washed and gullied fields on which cultivation is impracticable. Orchards can profitably go higher up the slope than any other agricultural crop, but our better judgment should not allow them to trespass on nature's domain.

SOILS FOR APPLE ORCHARDING.

Apple trees will grow on a great variety of soils, but they feel most at home and give their best results on deep, rich clays and loams. Why they prefer these soils it is impossible to say, but apple trees seem to be suited to clays just as cacti are to desert sands. The early or summer apples do well on light or sandy soils because they ripen their crop before the hot season, when moisture is scarcest. Late fall or winter varieties, which have to develop their fruit in the hot summer, when moisture is hardest to get, must have a soil that is retentive of moisture. Muck soils are rich and contain abundant moisture, but they produce large, rank-growing trees with tender terminals that produce poor fruit.

BEST RESULTS ON RICH SOILS.

Apple soils should be rich and they should not be called upon to produce anything but apples. It takes a great deal of fertility in the land to produce the wood of the trees on an acre of orchard. The fertility that produces the fruit is over and above that required to grow the trees. There are few crops so exhaustive on land as a crop of nursery stock, and no tillers of the soil know so well how to fertilize the soil as do nurserymen. If trees continued to grow in the orchard with the vigor they are made to do in the nursery there would be a thousandfold greater returns from orchards than there are to-day. From my experience and observation in horticulture I think it safe to say that seventy-five per cent of all the trees that leave nurseries die of starvation before they come to usefulness. Soil poverty destroys more trees than all the pests and plagues put together. A soil cropped to death with corn or cotton or tramped hard by the feet of stock is a certain burying ground for the tender and well-favored tree from the fertile soil of a nursery. The reason timber trees grow so well in their native forests is that the fertile, spongy mould of the forest floor affords an ideal home for the little seedlings till they get big enough to fend for themselves. Soil for orchards should be as nearly as possible like nature's model forest soil. Indeed, the best soils for fruit trees are those just vacated by the forest primeval and occupied by the orchard before they can be pre-empted by any other agricultural tenant. Mountain coves are ideal for orchards.

STUMPY AND STONY LAND FOR ORCHARDS.

It is by no means necessary that a virgin soil should be cleared of stumps and stones before planting the orchard trees. Unless a stump is actually in the place where a tree should be set, it is not necessary to go to the trouble and expense of having it removed. It is much cheaper to let stumps rot out gradually, and while they are doing so they are supplying humus to the growing fruit trees. Stony land is not at all objectionable for commercial orcharding. On steep locations they help very greatly to hold the rich soil from being washed away. It is probably for this very reason that in many mountain orchards the stony soils produce the best trees. Loose stones may be placed to form shelf terraces below the trees, or they may be placed in lines to form general terraces between each two rows of trees. Unless the soil is very thin, stones may be considered as a benefit rather than otherwise, because

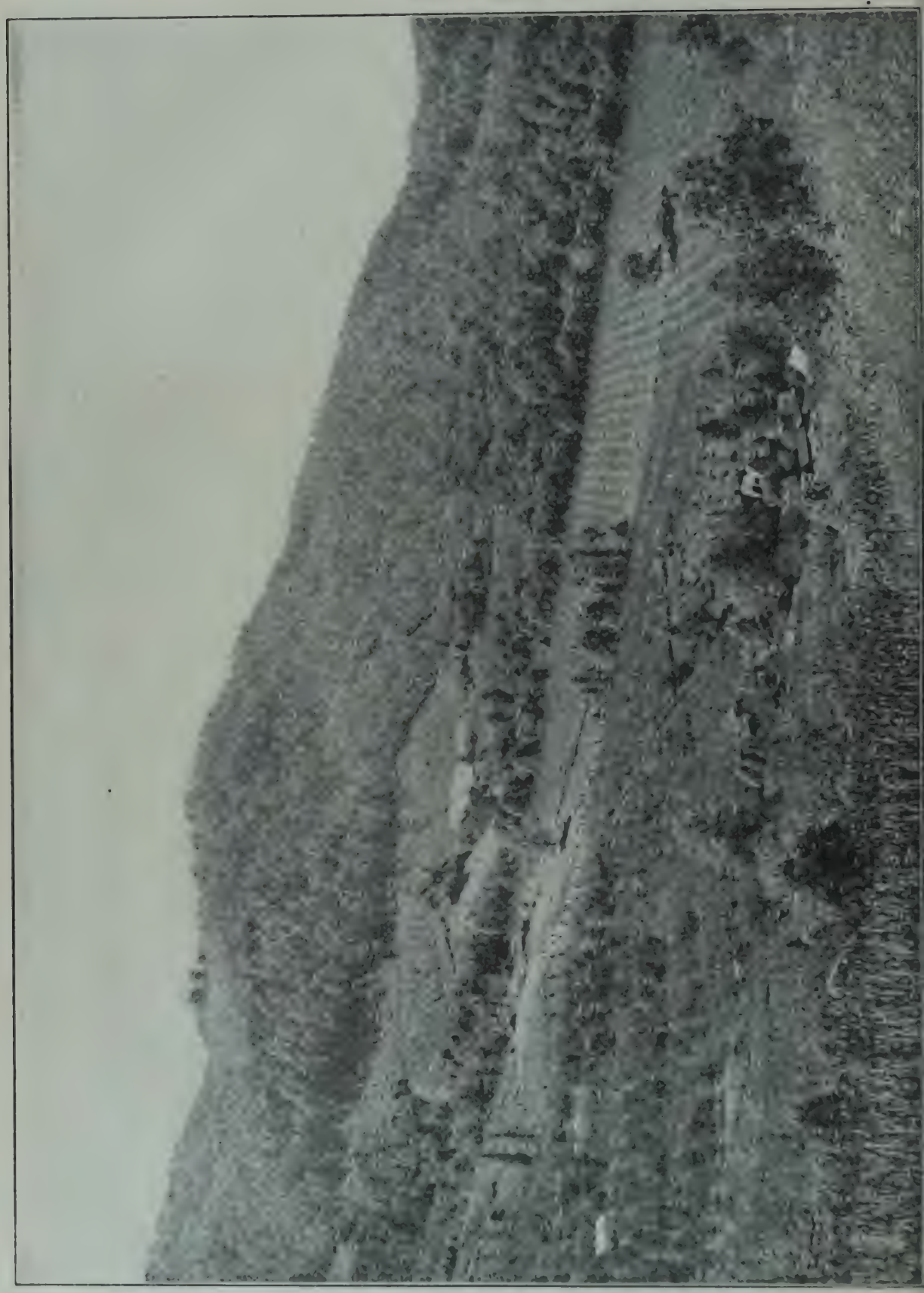
of the value they have to the land in assisting drainage and in protecting soil moisture. It is noticeable that fruit trees near rock piles or stone fences suffer little from drought.

NEW VS. OLD LAND.

Where virgin soil from the forest cannot be obtained for orchard planting, only rich land should be used. As an orchard will occupy the ground for many years, very thorough preparation should be given the soil before planting the trees. Never set trees on poor or dry land, for if they do start they are so stunted that it is next to impossible to ever get them to make a satisfactory orchard. Land kept in good tilth and used for cultivated crops can be expected to give reasonably good results in starting and growing orchard trees. Lands used for grain crops should be shunned for orchard work, as they are almost certain to be of the driest and poorest character. Old pasture lands are very poor for tree culture. They may be fairly rich from the droppings of the stock, but the humus in them is ruined by trampling and their mechanical texture is at its very worst. A good previous crop is a heavy growth of some kind of leguminous plant. This crop should be plowed down to furnish humus for the trees. It is more or less difficult and expensive to improve land after trees are planted; so it is best to spare no pains on previous preparation. Preparatory to setting the trees the soil should be deeply plowed. Clean surface cultivation should be given to conserve moisture. A liberal dressing of manure is always beneficial. The manure should never be put in the holes in which the trees are planted, but it should be incorporated in the soil by general cultivation.

LAYING OUT A MOUNTAIN ORCHARD.

Laying off land for tree planting on a hilly or uneven surface is much more difficult than on level ground. It takes a good eye and a careful hand to lay out an orchard so that the trees will line up every way. On level ground nothing less should be done, for crooked or irregular rows of trees are not only an eyesore and a living monument to the incompetency of the planter, but they are an endless vexation to the one who has to cultivate them. On mountain land the slope usually makes cultivation impracticable except parallel with the hillsides. This simplifies the problem itself, but one who has never tried hillside planting will be surprised at how difficult it is to get anything like a regular-looking orchard when the work is completed. If the slope is fairly regular—that is, with no "draws" or "coves"—one can measure up and down the hill and locate the ends of the rows on a base line at each end of the piece. If the land is not very steep, one can start at a bottom corner and measure up the hill, laying off the rows according to the distance desired between the trees. If the trees are to be 35 feet apart, which is the least distance standard trees should be set, he will simply measure up the hill, using one of the end boundaries as a base line and put in a stake at every 35 feet. Measuring down the hill, he should check up his distances to see that each was exact. Each stake so set would mark the end of a row. The same measurements should be made up and down the hill on the other border of the piece. Using these end stakes as fixed points, a row of stakes could be sighted in between to make a straight line. The plow could then be started and a perfectly straight furrow, practically parallel with the hillside, put in from this line of stakes. As the plowing proceeded, a second row of sighting stakes could be set up to mark the next row to be plowed. In proceeding in this manner the whole piece would be laid off in



exactly parallel furrows, running approximately parallel with the hillside. By making two rounds in each furrow the soil would be sufficiently plowed out, so that there would be very little more dirt to be thrown out with a shovel in planting the trees. In the highest and lowest parallel furrows stakes are set at every 35 feet. This marks the position of the trees in the first and last rows. From the second stake below a wire is reeled out and the end fastened tight to a stob driven in place of the second stake in the upper row. The wire is drawn tight between these two points and then slackened gradually till it conforms to the slope of the hill and rests on the ground in a straight line. Where the wire crosses the bottom of each parallel furrow will mark the spot where a tree is to be planted. The setting of the trees can now begin. While one man is distributing trees up or down the hillside along the wire other men

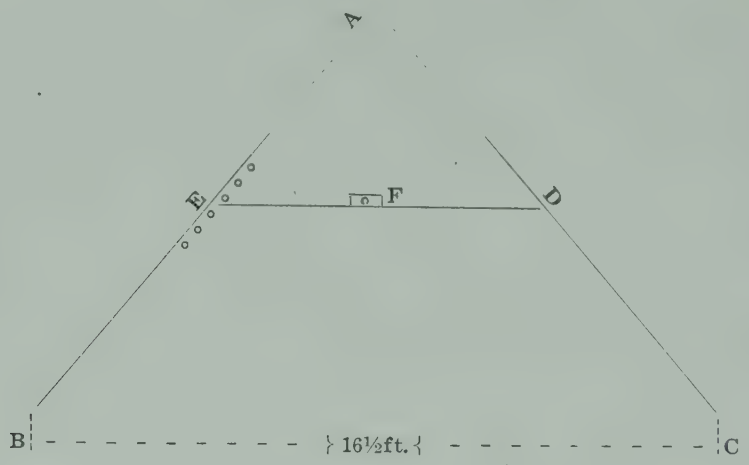
Fig. 2.—A hillside staked out in contours.

with shovels can be throwing out any extra dirt to make a proper hole and planting the trees. The wire can then be moved over to the next two stakes, and planting of the next row proceed in the same manner. A bright wire affords a very handy means of marking out the rows, for in the sun it shows like a silver ribbon and can be seen perfectly, even throughout a long stretch of land. If the land is steep the same method can be used, but instead of measuring off the 35 feet (the distance between two trees) on the slope it would be best to use a plumb line and level up, so that the 35 feet would be measured on the level instead of on the slope. On steep slopes, if some correc-

tion is not made for grade, it will be found that the rows are too close together. If the land is not too irregular, trees set out by this method will be found to "checker up" pretty well every way.

LAYING OFF IRREGULAR OR COVE LAND.

The foregoing method, though giving good results on even and regular slopes, will not be found practicable on irregular slopes or cove land. On these latter the best method is to terrace the land by running contour lines which will conform to all irregularities of slope and surface and bring all the trees in one row practically on the same level. The ground, whether rough or smooth, will be laid off in a series of steps. Where the slope is steep the contour lines will be made to diverge so as not to bring the trees too close together up and down the hillside. The most accurate method of laying off contours is by the use of a leveling instrument, such as is used by surveyors. From practical experience with hilly lands most mountaineers can by the eye lay off fairly good contours. There are, however, simple home-made levels that can be constructed in a few minutes which will lay off terraces that for all practical purposes are as good as those surveyed by an engineer. F. T. Meacham, superintendent of the Iredell Test Farm, gives the following description of the construction and use of a home-made terrace level: .



To construct an A level, use well-seasoned timber, pine being preferable because it is light and does not tend to warp. Take three pieces 10 feet long, 3 inches wide and ½ inch thick. Now lay on a level floor so as to get the instrument of a rod span. The rod is commonly used in measuring land and is generally best, as it gets over land faster than a ten-foot level. Drive two nails in the floor just a rod, or 16½ feet apart, saw off the ends of the two pieces to be used for legs so that the ends will rest flat on the floor. Now place one end of each leg against the nails and let the pieces cross above your head and just exactly over the center of the rod span. Put a bolt here through both pieces, fasten them together at the point A, then we have two legs of the level, AB and AC. Now take the third piece and use as a cross-bar, DE. Fasten the piece DE to AC at about D, bolt so as to permit it to work easily. Now place firmly on DE in the center a spirit level, such as you can get from almost any hardware store for ten cents. Bring DE, at E end, to a point on leg AB, where the spirit level indicates level; then mark or put a hole through both for bolt to work in. This hole on AB leg we call zero, which means level. Now we wish to make a scale that will enable us to run a terrace having a fall anywhere from an inch to four inches. Let some one

raise the foot of AB one inch and lower cross-bar DE until level; then put a hole through AB leg, and call this hole No. 1. Now raise foot of AB two inches and put another hole in AB leg and call it No. 2, and so on until we make our scale to four or five inches. The half-inch is then gotten by dividing the distance between holes and numbering halves. Now we have an instrument made that should not cost more than fifty cents at the outside, and will, if properly handled, suffice for most of this kind of work.

In terracing a field start about three feet from the top of the hill, and begin to lay off the first terrace. Usually about one to two inches fall to the rod will be sufficient. Try to put the second terrace so that it will be about three to four feet lower than the first, and so on down the hill until the whole field is terraced. Now, if a field has a swag about the center and water collects from both directions in this swag, to avoid this begin the terrace in the swag and go both ways, providing there is a good outlet at each end. Lay off the terrace, giving one to two inches fall, as desired, by fastening the cross-bar DE at E in the hole giving the fall desired. Start at the point we have selected to begin, and let the short leg, or the leg with the scale on it, be up-hill. The place for the terrace is found by raising the foot of the instrument up or down hill until the proper level is obtained, then let the boy carrying pegs stick one at the front end of the level; then go with the instrument to that point, and repeat same operation until all the terraces are laid off. When you come to a gulley make half sets with the instrument and set up-grade stakes to tell how high to build the banks to prevent breaking over by heavy rains. Now walk back over the line of stakes and when a place is found where there is too short a turn in the terrace, straighten a little or give a more gentle curve by moving the upper stakes a little down-hill; never move lower stakes up-hill.

After the terrace has been staked out a furrow can be run connecting the stakes. If desired, the terrace can be listed up by throwing several furrows together and the trees planted on the terrace. In planting orchards on contours it is impossible to have the trees line up as they would do on even land. The first row is set by simply spacing the trees along the contour at the regular distance desired. The second row is set by as nearly as possible alternating the trees with those in the first row set. As the work of setting proceeds the trees in each row will be alternated with those in the row preceding it. On account of the variability of slope it will be found impossible to exactly alternate the trees. Occasionally a tree will have to be shifted one way or the other, or one left out, in order to keep the spaces between the trees fairly uniform.

HOW TO PLANT A TREE.

It is not every one who can properly plant a tree. From the time trees leave the nursery until they are permanently planted they should be exposed just as little as possible. They should never be left open to sun or wind or air when it can at all be avoided. Trees waiting for planting should be heeled in with moist earth about the roots and only taken out of the ground when actually needed for setting. The hole dug for a tree should be large enough so that the roots may be spread out naturally in all directions. Yet it is not necessary to dig wide holes if the trees are heavy-rooted, for the roots of a tree always need trimming back at transplanting time. Cut back all roots, leaving a clean-cut surface. Remove all broken or torn roots and those that have become dried or dead. The cut surfaces should always show fresh living wood. When these clean-cut surfaces come in contact with moist soil the cambium grows out over the end and forms a callus, from which new roots start very readily.

The filling-in of the holes is the most important step in the work of tree-planting. To get the best results moist soil must be placed closely about the

roots, so that there are no air holes or crevices. The best instrument for accomplishing this work is the human hand. When the tree is placed in position the roots are spread out and a shovelful or two of the finest and best earth thrown in upon them. This should be carefully worked into the crevices with the fingers, and when the hole is about a third full the dirt about the roots of the trees should be tramped down solid. Moving the tree up and down while the earth is being thrown in will assist materially in avoiding air holes and in bringing the soil into close contact with all the roots. There is little danger of packing the earth too much, but trees often die for lack of tramping. After the roots are all covered and packed in tightly the hole may be filled with the remainder of the earth. Trees should be set in the orchard no deeper than they stood in the nursery. Deep setting is almost as injurious as too shallow setting. The collar of the tree is the natural indicator of the proper depth of planting. The surface should be left loose; tramping it would pack the soil so that it would lose moisture and dry out the tree. In planting trees do not pour water into the holes, for a slightly moist soil is much better than a very wet one. In very cold regions trees are best set in spring. In fairly mild climates trees get a better start if planted in the fall. In North Carolina, even in the mountains, the fall planting of trees will almost invariably give best results. The proper distance for setting standard apple trees is not less than 35 feet.

Since the root surface has been reduced in transplanting the tree, it is necessary to cut back the top in similar proportion to maintain a balance between top and root. If this is not done, when the tree comes into leaf the foliage will give off moisture faster than the reduced roots can supply it, and so the tree is dried out and killed.

FORMING THE YOUNG TREE.

There has always been considerable discussion among fruit growers as to what is the proper height to start young apple trees. High-headed trees have the advantage that they can be easily cultivated. On the other hand, with low-headed trees the fruit is much easier to pick, it is not so apt to be blown off by wind and the trunks are much less subject to sunscald. The advantages are much in favor of low-headed trees, especially in mountain regions. The best height at which to head the young tree is 2 feet. The most uniform orchards are made from setting trees one and not two years old from the bud or graft. The one-year-old trees are little whips, on which the grower can form just the kind of head he desires. They are, of course, cheaper than two-year-olds and the freight on them is less. Two-year-old trees are large and brushy and have a head formed on them under the unfavorable crowding of the nursery. Many of the heads formed on two-year-old trees in the nursery are badly formed and have to be cut off and a new head formed in the orchard. This reduces them to practically the whip condition of the one-year-old trees.

For the first season young trees should be allowed to grow pretty leafy. The more leaves they have the more wood they are able to form and the quicker they become established. After the trimming at planting time no pruning should be done the first season, except with especially vigorous trees to rub off a few of the sprouts at the collar and on the lower part of the trunk. In the spring of the second season a very thoughtful and careful pruning should be given. This is the most important pruning in the whole life of the tree and in a great measure determines the future usefulness of the tree. Trees should not be started with too many main limbs, as afterwards they thicken up and crowd

each other and make it necessary to cut out very large limbs. This leaves very large wounds, which seldom heal over and usually cause the trunk of the tree to decay and become hollow. The cutting of large limbs is always a damage to a tree and should never be practiced except in the most extreme cases. Three or at most four main limbs are enough for any fruit tree, and if properly placed on the trunk it will never be necessary to cut out a large limb. All main limbs should not start out at the same height on the trunk, for all the weight of limbs and of fruit being directed at a single point, the tree is liable to become split down by the wind. Opposite crotches should be avoided. As far as possible have each main limb started so that it has the purchase of the whole trunk opposite it. Remove all suckers or water sprouts and limbs that cross and rub each other or that follow other limbs too closely in a parallel direction. The idea should be to obtain a symmetrically formed head, with the space well divided, so as to give each branch the maximum of light and air. There are different general forms of trees that are preferred by different growers. Some like an open vase form of head, with hollow center and diverging branches. Such a tree is obtained by removing the leader bud in the little tree. Another form of tree desired by some growers is the "double-decked" or "two-story" tree, gotten by carefully maintaining the leader and allowing the tree to form a high top. With young trees it is nearly always necessary to head back the annual growth. From one-fourth to one-half the length should be cut from all long shoots. This causes the tree to thicken up and the branches to become thick and stocky. If heading-back pruning is not given young trees they will become tall and spindling and easily broken down when laden with fruit.

VARIETIES.

What varieties shall I plant? is a question oftener asked than any other horticultural inquiry. It is one of the most difficult questions to answer, for unless one knows the district and has seen its possibilities he can at best but make a good guess. The most exact and practical method of finding out what varieties do best in any section is for the intending planter to hitch up his best horse and visit the orchards in his vicinity. Varieties of fruit are much less selective as regards locality than is generally believed. It was formerly believed that the Albemarle Pippin could be grown nowhere with marked success but in a certain mountain region in Virginia. This very variety is now grown to such perfection on the Pacific coast that it threatens to drive the Virginia Albemarle out of the market. More of the elements of successful fruit culture are in the grower than in the variety. If one likes a certain variety he generally gives it the conditions that make it successful. The characteristics of a good commercial apple are as follows:

1. Tree heavy bearer.
2. Tree vigorous and healthy.
3. Fruit of fair size and bright color.
4. Fruit keeps and ships well.
5. Fruit of fair to good quality.

The thing of prime importance with commercial orchards is that varieties be used that are heavy bearers. The only kind of successful commercial orchard is the one that produces, *fruit*, FRUIT, FRUIT. No matter what other charac-

teristic a variety may possess, if it is not a heavy producer it has no place in a commercial orchard. The commercial apple should be showy and of fair to large size. The money-making market apple is "the big red apple." With but a few notable exceptions markets want red apples. It is hard to educate the market; it has its prejudices and it is willing to pay for them. The commercial apple should be a good keeper and shipper. This assures a long season of sale and an attractive appearance on arriving in market. It should have, too, the finest texture and best flavor consistent with keeping and shipping quality. Some varieties of apples of notably poor quality have in the past proved to be good money makers. Shipping and storing facilities are improving every year, and apples of fine texture and good flavor can now be placed in the best markets in perfect condition. The commercial apple of the future must have far better than Ben Davis quality.

The apple growers of Western North Carolina have not been living up to the ideal horticultural possibilities of their clear, salubrious climate and rich mountain slopes. They can grow the best of the best. There are much better commercial apples than the Limbertwig, Stein and Grannie Buff. From these same slopes I have seen as fine Baldwins as ever grew in Massachusetts and as big Blacktwigs as ever came out of Arkansas.

A commercial orchard, even a large one, should contain few varieties. Many fair-sized orchards have such a desultory collection of odd varieties coming on at all seasons of the year that the total output is of no consequence for market purposes. If I were planting a commercial apple orchard in Western North Carolina—and I know of no better horticultural proposition—I would plant largely of the few following varieties:

York Imperial,	Stayman,
Rome Beauty,	Albemarle,
Arkansas Blacktwig,	Bonum,
Winesap,	Buchingham.

AVOID BLOCK PLANTING.

Varieties of fruit should not be planted in orchards in large, solid blocks. Some of the most productive varieties are not readily fertilized with their own pollen. Such varieties would be unproductive unless situated so that their blossoms could be pollinated by other varieties blooming at the same time. Old orchards teach their lessons along this line. A commercial orchard under observation recently consisted of four varieties, in solid blocks, in the following order: Baldwin, Golden Russet, Roxbury Russet, and Spy. The Baldwin is a self-fertilizing variety, and whenever there was any fruit in the orchard it could always be found on the Baldwins. The Golden Russets were laden with fruit on alternate years. The Roxbury Russets were pretty generally productive. The Spy block was uniformly unproductive, except for a couple of rows next the Russets, which bore well whenever the orchard bloomed. Many good varieties of fruit are unproductive because they are so situated that their blossoms cannot be pollinated from neighboring varieties. Instead of planting varieties in solid blocks they should be planted in alternating rows. This may make a little more trouble at packing time, but there will almost invariably be more to pack.

CULTIVATING ORCHARDS.

In horticultural papers discussions are often seen as to the advisability of cultivating or not cultivating bearing orchards. Regarding young trees there is not a shadow of a doubt of their being benefited by cultivation. Indeed, it is only a loss of time and money to plant trees without giving them cultivation at least during their early years. Little trees left to struggle against weeds, drought and a poverty-stricken soil very soon give up the struggle. If by chance they do survive they become so stunted that they are never of much value. Where the land is not too steep and rough, clean, shallow cultivation should be given over its whole surface. The plow should not be used in the orchard any oftener than necessary. An Acme harrow is a good orchard tool, and on land that is not stony a disc harrow is one of the best. Implement builders are now making for orchard work a reversible disc cultivator that does not ridge up the land and that has an extension for working under low-headed trees. As soon after rains as the land is in suitable condition it should be gone over lightly to make a surface mulch for conserving moisture. For cultivating close to the trees and reducing hand hoe work to a minimum a Planet, Jr., cultivator is one of the best tools. None but a careful man should ever be allowed to cultivate an orchard. A mule and a careless man can do more harm to trees in an hour than all the insects and diseases on record. Low collars and hames should be used on the horses, and they should be hitched to short whiffletrees. Chain traces should be wrapped with burlap to keep them from injuring the bark of the trees. There are special whiffletrees manufactured for orchard work which have the traces attached in such a way that there are no projecting ends to catch the bark.

Before midsummer trees make most of their growth; the latter part of the season is used in developing the shoots and in ripening the terminal buds. If cultivation is continued after midsummer the terminals will continue to grow, and the immature growth thus made will be frozen back during winter. Cultivation should begin early in spring and cease early in summer.

Where land is too rough and rocky for general cultivation a circle should be dug by hand about each tree. A mattock or heavy hoe is a handy tool for doing this work. The first year a circle of two to three feet in diameter will be sufficient. As the roots spread the circle of cultivation should widen out. Lack of cultivation while the tree is small is always attended with loss.

THE SOD-MULCH ORCHARD.

A great deal has of late been written in horticultural papers regarding the value of the sod method and the sod-mulch method of handling of orchards as compared with clean cultivation. On easily tillable land cultivation is the surest if not the most economical way of retaining soil moisture. On rough, rocky or steep lands, such as are common in mountain regions, where tillage is difficult, modifications of the sod or the sod-mulch methods will be found advantageous. The Hitchings method of orcharding, of which a great deal has been heard of late, advocates the clearing roughly of the land from woods and the setting of the little apple trees among the stumps. No cultivation is given, but the grass and weeds are cut away with the scythe and timothy seed sown so that a sod will be formed. As the stumps rot sufficiently to be removed conveniently they are taken out and the ground is worked and seeded down to timothy. The orchard is then mowed with a mowing machine once

or twice during the season and the grass allowed to lie and rot on the ground and form a partial mulch. Under certain conditions some growers have reported good results from this method. My own experience and observation compel me to advocate cultivation, and cultivation only, for the growing tree. After it has a fair root range it may be able to take care of itself and give good results in partial sod or under sod mulch. The color of the foliage and the amount of wood a young tree is able to form will indicate whether or not it is able to compete successfully with the vegetation beneath it. After trees are of bearing age there is no place in which they are better able to go without cultivation than in mountain regions. On land difficult of tillage and in terraced orchards the ground may be sown to grass and the grass cut and allowed to rot beneath the trees. If the trees are not occupying the whole soil with their roots it is best to pile the grass in the form of an individual mulch about each tree. Where the tree roots spread so as to cover the whole ground the grass may be allowed to decay where it falls. In most cases it would pay the orchardist to go a step further than this and apply in addition any cheap material that could be readily obtained to thicken the mulch.

ORCHARD FERTILIZERS.

If we added together the sum total of injury to orchards from insects, diseases and frosts we would then have only a fraction of the losses due to poverty-stricken soils. "Saul and Jonathan may have slain their thousands, but David hath slain his tens of thousands." A great many more trees die of slow starvation on impoverished soil than perish from all other causes. If farmers gave their corn or cotton or truck crops no more fertilizer than they do their fruit trees they would not expect a crop. Somehow or other a tree is expected to take care of itself without cultivation or plant food, and even while the soil about it is growing another crop, or is tramped hard by stock, it is supposed to produce a crop of fruit. Under such circumstances, instead of producing fruit (the product of its surplus energy) it has a struggle to maintain its existence. There is a good deal of plant food locked up in the wood of the root, trunk and branches (the working parts of the tree). It is only the surplus, after all necessities for growth are satisfied, that can go into fruit production. Growers often complain of their trees casting their fruit. This is because the tree finds itself unable to produce fruit and have a living balance left; so to maintain its existence it casts off its fruit. After a heavy crop many trees succumb because they have not sufficient reserve force left. Such trees could be saved by a fertilizer application supplying some of the ingredients exhausted by the crop.

A tree that is growing and building up its system of trunk and branches above and below ground requires a different fertilizer from a tree that already has these formed and is able to produce fruit. Growing tissues require considerable nitrogen and less of phosphoric acid and potash. Fruit production requires on the other hand a maximum of phosphoric acid and potash with a reduced amount of nitrogen. Stable manure is one of the very best fertilizers for young trees, but if used in large quantities on mature trees may stimulate too great a growth of wood at the expense of fruit production. Ashes are one of the best fertilizers obtainable for bearing trees. Where cover crops are used in the orchard they supply sufficient nitrogen to keep the trees in a good growing condition. If a dressing of acid phosphate and kainit at the rate of

250 pounds of each per acre be applied it would put the trees in good fruiting condition. One of our most successful growers uses for growing trees on light land the following fertilizer:

Phosphoric acid,	8 per cent	500 pounds per acre.
Nitrogen	5 per cent	
Potash	2 per cent	

And for fruiting trees on similar land:

Phosphoric acid,	8 per cent	500 pounds per acre.
Nitrogen	3 per cent	
Potash	10 per cent	

CROPS IN THE ORCHARD.

At the proper distance of setting there will be in a young orchard a considerable proportion of land not in use by the trees. This can be conveniently and profitably used by other crops until the trees get large enough to need the whole land. When of bearing age a tree should have all the land on which it stands. It is not possible to produce two crops on the same land at the same time. If in a mature orchard the land is used to produce other crops, very little can be expected from the trees. In young orchards cultivated crops may be used to advantage to utilize vacant land, and at the same time the fertilizer and cultivation given will be useful to the growing trees. The best crops in the young orchard are those that mature early and thus do not compete with the trees during the summer season for their moisture and plant food. Early potatoes is one of the best crops; also snap beans and garden peas. Such crops leave the land in good tilth and do not draw heavily on the trees. Crops like corn, tomatoes and melons, that usually have to be cultivated later in the season, are not so suitable, because the later cultivation stimulates the trees to make growth too late in the season. With such crops they should not be allowed to come too close to the tree rows, and in no case is it advisable to plant in the tree row itself. For the first season a space of 4 feet on each side of the row should be given the little trees. In the following years this strip should be widened every year till the supplementary crops are crowded out and the trees are occupying the whole ground. In no case should grass crops or small grains be grown in the young orchard.

COVER CROPS FOR ORCHARDS.

As soon as cultivation ceases in an orchard the finely worked soil should be utilized as a seed bed for a cover crop. Leguminous plants are best for orchard cover crops, because they not only hold the soil and take up the plant food made available by cultivation, but, being nitrogen gatherers, they add to the soil this most expensive and elusive fertilizing constituent. Leguminous cover crops are the cheapest as well as the easiest means of adding nitrogen to the soil. During their growing period especially, orchard trees require a copious supply of nitrogen. With bearing orchards it is possible on rich land to use leguminous cover crops too frequently. If there is too much nitrogen supplied to the soil the trees will make wood and leaf growth at the expense of fruit. If the trees are found to be making too much new wood and the fruit does not color well it is advisable to leave out the cover crop for a year

or two, till the balance is restored. Such a condition happens only under the most intensive tillage. What we usually see is orchards suffering grievously and starving for the want of cover crops. One of the best cover crops, especially for summer, is the cowpea. Unfortunately this plant does not grow well in mountain regions and it stops growing entirely at the first frost. Hairy vetch is a winter grower that makes a useful cover crop, but my experience has shown that crimson clover is the best cover-crop plant for mountain orchards. It should be sown early, when moisture is abundant. If the land is very poor it is difficult to get a stand of it, but with a reasonable chance it makes one of the best, if not the very best, cover crop. It will grow

Fig. 3.—Young Tree Protected from Rabbits by Veneer.

during the fall and most of the winter, and will add much to the fertility of the soil. It should be plowed or worked in early in spring, for it does not gain anything for the land by being left to flower and seed, and by the delay much valuable moisture is lost. By the use of cover crops the land is kept full of humus, which is so necessary to the holding of moisture. Orchard slopes rich in humus will absorb and hold a great deal of rain before they show any signs of washing. When lands begin to wash it is a sure sign that they are deficient in humus and have not been tilled to cover crops.

As has been said before, it is best to cultivate orchards during the early part of the season. Cultivation should begin as early in the season as the land

can be properly worked. If necessary, the land should be plowed, and plowed shallow, but if it is possible to break up the land and to work in the accumulation of vegetable matter with a harrow or disc cultivator without plowing, it is best to do so. If the soil is taken in time and the accumulation of vegetable matter is not too heavy and green, it will usually be found that a disc cultivator will do the work thoroughly and more cheaply than the plow.

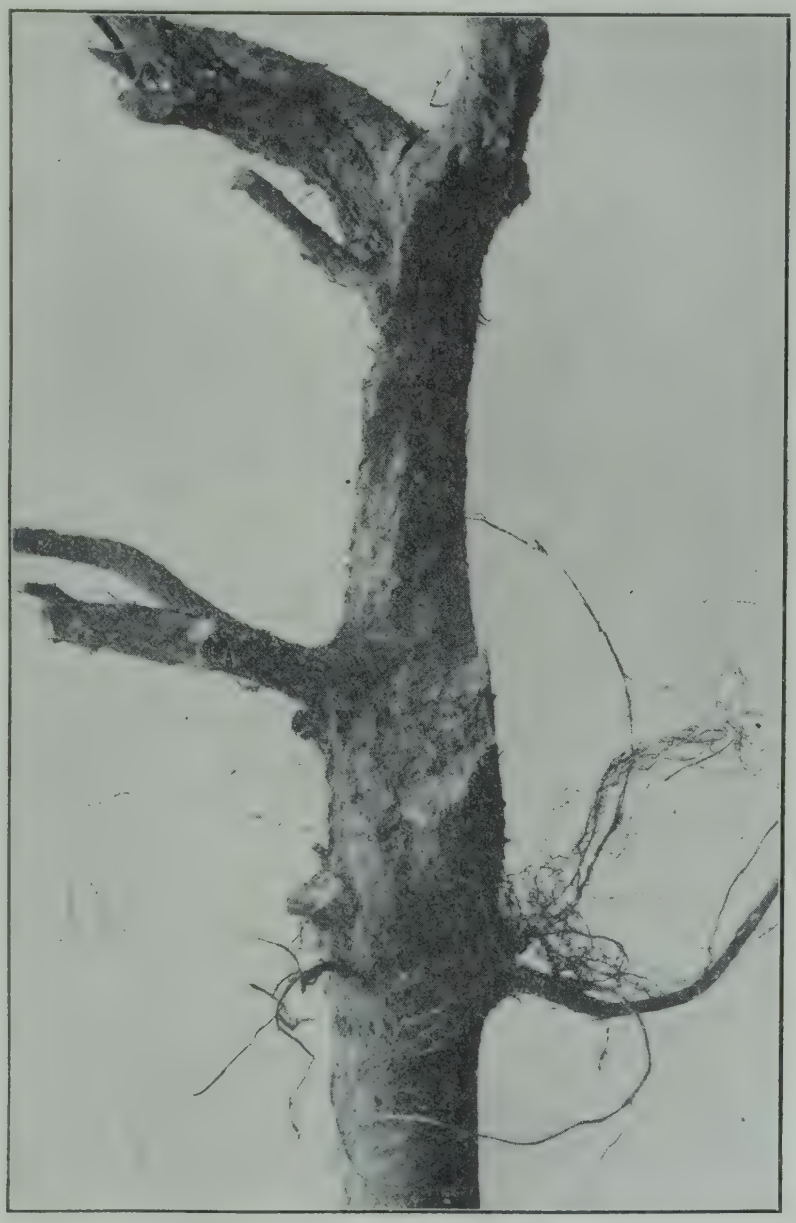


Fig. 4.—Roots of Tree Eaten off by Mice.

From this earliest cultivation the orchard should receive numerous shallow workings till midsummer. After each rain a light brushing with a harrow will do wonders in conserving moisture for the use of the trees. By midsummer it will be found that all the new shoots on the trees have made practically their season's growth. The remainder of the summer and fall is used

in maturing this growth and in ripening the terminals. If cultivation is continued after midsummer the trees are encouraged to make a long, sappy growth that will not mature, but will be killed by the first frost of winter.

WARDING OFF MICE AND RABBITS.

A simple but by no means trifling drawback to orcharding in mountain regions is the destructive attacks of mice and rabbits. In a single winter's night one hungry rabbit will completely girdle and destroy trees that it has taken several years of labor and expense to produce. A few of these rodents, if not checked, will in a few weeks in winter entirely ruin valuable orchards. They seem to prefer apple bark to that of natural forest growth. The extensive timber lands of mountain regions afford harbor for rabbits, and an isolated orchard runs great risk. Small boys, with the usual desire for a dog and a gun and an appetite for rabbit pie, will do much to allay the trouble, but every careful orchardist should take special pains to protect his trees. The rabbit is a vegetarian, and blood and animal matter smeared on the tree trunks will do much to ward off his attacks. I have found, however, that the safest method is to wrap about the tree trunk a wooden veneer and fasten it securely with a wire. (See Fig. 3.) This may take a little more trouble than other methods, but I have always found it a sure cure.

The injury of mice to trees would to the uninitiated appear to be trfling, but the harm they do to young trees is usually much more serious than that done by rabbits. Fig. 4 shows a young tree two years old set in a mountain orchard, the roots of which have been entirely eaten off by mice. In this orchard, which was not cultivated, several hundred trees were destroyed. There is but one practical cure for the mice trouble, and that is clean cultivation.

SPRAYING.

Under present orchard conditions spraying is an absolute necessity in successful fruit production. It is practically impossible to raise good fruit now without spraying. One might as well try to raise fruit without planting the trees as to try to raise clean, marketable fruit nowadays without spraying. On account of the widespread culture of apples and the ever-increasing acreage of orchards it is only natural that the insects and diseases which prey upon the apple crop should be more numerous than they were a generation ago. To raise clean fruit one must spray, and spray persistently. That it pays to spray no one who has ever once tried it will for a moment question. Spraying is one of the necessities of the fruit business just as much as tillage, fertilization or marketing. It is not the purpose of this BULLETIN to discuss methods of making spraying mixtures or their application. Numerous bulletins on all phases of that subject have been published and can be had on application to this Department.

Commercial apple orcharding in the mountain regions is one of the most promising horticultural industries in this State. Many large orchards have been planted and thousands of trees are being set each year. Many mature orchards now in bearing are showing the advantages of rich mountain soils and a clear, cool climate, and are bearing large crops of rich-colored fruit. Young orchards, where given good care, are showing by a vigorous growth that the mountain sides are for them an ideal home. In spite of an ever-increasing acreage of orchard trees the prices paid for first-class apples are

steadily advancing. There is at present an increasing demand for first-class fruit at fancy prices. The possibility of overproduction seems to be nowhere in sight. In the great cities of the States south of us North Carolina has a natural market for commercial winter apples. By geographical position and direct lines of transportation she has in Southern markets advantages over all Northern competitors in apple production. The unit of commercial production is the carload. Some cities in our oldest apple-producing counties are already handling apples on this scale. It is to be hoped that farmers in all our mountain regions will make use of their great natural advantages of soil and climate to develop large apple-shipping centers where wholesale buyers will come and purchase fruit in carload lots. To this end growers should plant only the best commercial varieties. The day of the seedling apple has passed. Spraying should be considered as an inseparable adjunct to fruit growing. Fruit should never be shipped in crates, but should be packed in tight barrels or boxes, and only clean, graded fruit should go to market.

In the oldest apple-producing sections land has greatly increased in value. Lands which were formerly considered of no use or of only trifling value for rough pastures are now held at high prices on account of their production of high-class, high-priced fruits. Many steep slopes formerly the prey of destructive erosion are now held in profitable use by the strong, tenacious roots of apple trees. Unlike annual crops, orchard trees add a yearly increment to the value of the land. A little apple tree of standard variety, when once established in an orchard, increases in value under good cultivation at the rate of one dollar a year for every year it grows towards its maturity. This gives some slight idea of the value and possibilities of mountain regions for commercial apple production.

VARIETIES OF FRUIT FOR GROWING IN NORTH CAROLINA.

W. N. Hutt.

The selection of suitable varieties is fundamental to success in fruit growing. If the tree is not of the proper breed, it makes no difference how rich the soil or how careful the tillage. Orchards are often seen that are on good soils and receive the most assiduous attention of their owners, but at harvest time they give no fruit, or fruit of only indifferent quality, in return for all the trouble and expense bestowed upon them. It is just as necessary for the successful fruit grower to have trees of the right breed as for the dairyman or the stock raiser to have animals of the right breed. Indeed, the stock raiser, finding he has made a mistake in the selection of his animals, can more easily and cheaply remedy his error than can the fruit grower who has planted an orchard with poor nursery stock.

A great deal of harm has been done to fruit growing by the irresponsible, itinerant tree peddler. Many farmers have, to their sorrow, paid high prices to tree peddlers for trees, the fruit of which was represented to them by enlarged and over-painted pictures, bolstered up by imaginary and flamboyant descriptions. Most of the fruit trees sold by such persons turn out to be entirely worthless or to be old varieties renamed, or inferior varieties substituted for standard sorts. A farmer once showed me a mature orchard, the trees of which had been bought from a traveling nursery agent. It consisted of eight acres and was supposed to be set with four leading commercial varieties. The orchard had been carefully tended for fifteen years. On coming into bearing, there were found to be as many varieties as there were trees, and not one of them was of any account. They had been simply ungrafted, seedling trees. Such an experience forever disgusts the ordinary farmer with fruit growing. If these trees had been purchased from a reliable nursery no such loss would have been experienced by the grower. Reputable nurserymen are in the business to stay in it, and they take pains to grow only useful varieties and exercise the greatest care to keep varieties true to name.

In the following pages will be found lists of varieties of each of the classes of fruits that can be grown in North Carolina. Although a great deal of thought, travel and research have been given to the making of these lists, they are by no means to be taken as absolute or perfect. No effort has been spared to make them as accurate as possible, yet the behavior of varieties depends so much upon conditions that the lists are to be considered as suggestive rather than dogmatic. There are many old and standard varieties that from wide dissemination by nurserymen have shown themselves to be cosmopolitan in habit, and their behavior in any locality can be counted on with a fair degree of certainty. Some newer varieties, of high quality and exceptional promise, have not yet been widely enough grown to guarantee their good behavior in all locations. Other varieties have shown themselves to be rather fastidious of location, and give in some situations exceptional results and in others utter failures. To this class belong such fine varieties as Albemarle, Jonathan, Baldwin and Spy.

In the preparation of the following lists the idea has been especially to encourage commercial fruit culture. In doing this it has been the aim not to make an extended and exhaustive list of all varieties that are now in cultivation within our borders, but to recommend those which have shown themselves to have the especial excellence that warrants them displacing other varieties. For this reason growers may be surprised at the absence of certain varieties from these lists. The present lists are the product of many years of work in horticulture, together with the revision of all former lists published by this Department. A careful comparison of nursery catalogues has been made, and data on varieties collected from over a thousand letters from fruit growers in this State. I beg to acknowledge, also, the valuable suggestions on varieties from Prof. H. H. Hume, formerly of this Department, and of Prof. F. C. Reimer, of the North Carolina College of Agriculture and Mechanic Arts.

In the making of these lists of varieties for commercial culture it has been kept in mind that quality should be as high a consideration with commercial varieties as with those for home consumption. These lists may therefore be followed with safety for use in the home orchard and garden. The descriptions of varieties, arranged in alphabetical order, will give intending planters the nature and habits of each variety recommended. As the State of North Carolina extends from the surf of the Atlantic Ocean to a height of over 7,000 feet, the highest altitude east of the Rocky Mountains, it naturally divides itself into three horticultural zones. These are defined at the head of the fruit lists as Mountain, Piedmont and Coast. As fruits vary in earliness with altitude, what will be a summer fruit in the coastal region will usually be classed as an autumn fruit in the mountains. In classifying fruits allowance must always be made for altitude.

The general soil requirements for the succeeding classes of fruit may be briefly catalogued as follows:

Apples	Rich loams and clays.
Pears	Heavy clays.
Plums	Clays and loams.
Peaches	Loose sandy or shaley soils.
Cherries	Deep rich loams.
Grapes	Well-drained loams.
Quinces	Deep moist loams.
Figs	Rich moist, sandy loams.
Raspberries	Rich moist loams.
Currants	Rich moist loams.
Blackberries and Dewberries	Rich moist loams, and sands.
Gooseberries	Rich moist loams.
Strawberries	Very cosmopolitan, almost any soil.
Crab Apples	Deep rich loams.
Mulberries	Deep rich loams, and sands.
Pecans	Sandy loams.
Pomegranates	Sandy loams.
Japanese Persimmons	Loams and sands.

APPLES.

SUMMER VARIETIES.

Mountain.	*Piedmont.*	*Coast.*
Chenango.	Chenango,	Early Harvest,
Early Harvest,	Early Harvest,	Early Colton,
Maiden Blush,	Early Colton,	Horse,
Oldenburg (Duchess),	Horse,	Red Astrachan,
Red Astrachan,	Maiden Blush,	Red June,
Red June,	Oldenburg (Duchess),	Sweet Red June (Eckel),
Summer Pearmain,	Red Astrachan,	Williams,
Sweet Red June (Eckel),	Red June,	Yellow Transparent.
Yellow Transparent.	Summer Pearmain,	
	Sweet Red June (Eckel),	
	Williams,	
	Yellow Transparent.	

AUTUMN VARIETIES.

Belleflower,	Bonum,	Bonum,
Bonum,	Buckingham,	Buckingham,
Buckingham,	Grimes Golden,	Mother,
Grimes Golden,	Gravenstein,	Virginia Beauty.
Gravenstein,	Jefferis,	
Jefferis;	Mother,	
Mother,	Virginia Beauty.	
Virginia Beauty.		

WINTER VARIETIES.

Albemarle (Yellow Newtown),	Ben Davis,	Ben Davis,
American Golden Russet,	Dula Beauty,	Gulley (Mangum),
Baldwin,	Gano,	Horse,
Ben Davis,	Hoover (Baltimore Red),	Mattamuskeet,
Fallawater,	Limbertwig (Red),	Shockley,
Gano,	Limbertwig (Royal),	Stayman,
Hoover (Baltimore Red),	Mammoth Blacktwig (Arkansas),	Winesap,
Jonathan,	Pope (Seedling),	Yates,
Mammoth Blacktwig (Arkansas),	Rome Beauty,	York Imperial (Johnson Fine Winter).
Northern Spy,	Smith Cider,	
Rome Beauty,	Sparger,	
Roxbury Russet,	Stark,	
Smith Cider,	Stayman,	
Smokehouse,	Winesap,	
Spitzenburg (Esopus),	York Imperial (Johnson Fine Winter).	
Stayman,		
Winesap,		
York Imperial (Johnson Fine Winter).		

PEARS.

Of late years, on account of the ravages of pear blight, the present list of varieties of pears is necessarily very short. Owing to the deadly work of this fatal disease of the pear, most of the high-quality varieties are disappearing from cultivation. The names of old standard varieties are in most fruit regions passing into ancient horticultural history and are disappearing from orchard and nursery lists. With the exception of the resistant Seckel, it is extremely risky nowadays to set for commercial growing any varieties

of pears except the resistant low-quality sorts of the Chinese class, such as Garber, Le Conte and Keiffer. Pears are most resistant of blight when grown slowly on clay land without being stimulated by cultivation.

PEARS.

Mountain.	*Piedmont.*	*Coast.*
Anjou,	Anjou,	Garber (Chi.),
Bartlett,	Bartlett,	Keiffer (Chi.),
Early Harvest,	Early Harvest,	Le Conte (Chi.),
Flemish Beauty,	Flemish Beauty,	Magnolia (Chi.),
Garber (Chi.),	Garber (Chi.),	Seckel,
Howell,	Howell,	Smith (Chi.).
Keiffer (Chi.),	Keiffer (Chi.),	
Le Conte (Chi.),	Le Conte (Chi.),	
Seckel,	Magnolia (Chi.),	
Sheldon,	Seckel,	
Winter Nelis.	Sheldon,	
	Winter Nelis.	

PLUMS.

Our list of cultivated plums is made up from several sources. We have our American plums, represented by the Miner, Weaver and Wild Goose, which are suited to our climate and grow and bear well in all parts of the State. This class of plums does not, however, compare in quality with the domestic class of plums introduced from Europe. The varieties, Bradshaw, Coe, General Hand and Imperial Gage belong to the European class. Unfortunately the European plums do not thrive well except in the cooler mountain regions. In the last decade or so very valuable additions have been made to our list of plums by importation from Japan. The Japanese plums thrive well in all parts of the State, but are especially valuable for the coast region, where the European plums are not successful. Abundance, Burbank and Kelsey are varieties of the Japanese class.

PLUMS.

Mountain.	*Piedmont.*	*Coast.*
Abundance (Jap.),	Abundance (Jap.),	Abundance (Jap.),
Bradshaw (Eur.),	Chabot (Jap.),	Chabot (Jap.),
Chabot (Jap.),	Clifford (Amer.),	Clifford (Amer.),
Coe (Golden Drop, Eur.),	Climax (Jap.),	Climax (Jap.),
Damson (Eur.),	Damson (Eur.),	Damson (Eur.),
General Hand (Eur.),	Golden Beauty (Amer.),	Excelsior (Amer.),
Imperial Gage (Eur.),	Kerr (Jap.),	Golden Beauty (Amer.),
Lombard (Eur.),	Miner (Amer.),	Kerr (Jap.),
Lady Washington (Eur.),	Munson (Amer.),	Miner (Amer.),
Miner (Amer.),	Ogon (Jap.),	Munson (Amer.),
Red June (Jap.),	Red June (Jap.),	Ogon (Jap.),
Weaver (Amer.),	Weaver (Amer.),	Red June (Jap.),
Wild Goose (Amer.),	Wickson (Jap.),	Weaver (Amer.),
	Wild Goose (Amer.),	Wickson (Jap.),
		Wild Goose (Amer.).

PEACHES.

The list of peaches that can be grown in North Carolina is such a long one that one has to cut down rather than build it up. The following varieties have been selected as those having the most desirable characteristics. Peaches do best in light or sandy soils.

PEACHES.

Mountain.	*Piedmont.*	*Coast.*
Bilyeu,	Belle of Georgia,	Belle of Georgia,
Carman,	Bilyeu,	Carman,
Chairs Choice,	Carman,	Champion,
Crawford Early,	Champion,	Chinese Cling,
Crawford Late,	Chinese Cling,	Connett,
Elberta,	Chairs Choice,	Crosby,
Greensboro,	Connett,	Elberta,
Mountain Rose,	Crosby,	Greensboro,
Mathews Beauty,	Elberta,	Hale.
Smock,	Greensboro,	Heath,
Sneed.	Heath,	Ingold,
	Ingold,	Mayflower,
	Mayflower,	Salway,
	Mountain Rose,	Smock,
	Reeves,	Sneed,
	Salway,	St. John.
	Smock,	
	Sneed,	
	St. John.	

CHERRIES.

Cherries are divided horticulturally into two classes, the Dukes or Morellos and the English or Sweet cherries. These two types are quite different in form and in hardiness. The Duke or Morello cherries are characterized by a slow, firm growth of wire-like branches with very smooth, tough, leathery bark. The trees will grow over a much wider area than the Sweet cherries, and are much more resistant in the coastal region or cotton belt. The Sweet cherries are large, rapid-growing trees with thick, heavy twigs and branches. The Sweet cherries grow to perfection in the rich soils and cool climate of the mountains. They will do fairly well in the piedmont region, but are almost invariably unsuccessful in the coastal plain.

CHERRIES.

Mountain.	*Piedmont.*	*Coast.*
Black Tartarian (sweet),	Black Tartarian (sweet),	Dyehouse (sour),
Dyehouse (sour),	Dyehouse (sour),	Early Richmond (sour),
Eagle (sweet),	Eagle (sweet),	May Duke (sour),
Early Richmond (sour),	Early Richmond (sour),	Montmorency (sour),
Gov. Wood (sweet),	Gov. Wood (sweet),	Morello (sour).
May Duke (sour),	May Duke (sour),	
Montmorency (sour),	Montmorency (sour),	
Morello (sour),	Morello (sour),	
Napoleon (Royal Ann) (sweet),	Napoleon (Royal Ann) (sweet),	
Reine Hortense (sweet),	Wragg (sour),	
Wragg (sour),	Windsor (sweet),	
Windsor (sweet),	Yellow Spanish (sweet).	
Yellow Spanish (sweet).		

GRAPES.

The grapes grown in this State are of two native types, the Labruscas or bunch grapes and the Muscadines or "Bullaces." The bunch grapes have a very wide range of growth and will thrive in all parts of the State. The Muscadine grapes, which are represented by the varieties Scuppernong,

James, Meisch and Flowers, are native in the coastal plain and grow there to great perfection. They can be grown to some extent in the lower piedmont, but will not thrive in the mountains.

GRAPES.

Mountain.	*Piedmont.*	*Coast.*
Agawam,	Agawam,	Brighton,
Brighton,	Brighton,	Brilliant,
Brilliant,	Brilliant,	Concord,
Catawba,	Catawba,	Delaware,
Concord,	Concord,	Diamond,
Delaware,	Delaware,	Flowers,
Diamond,	Diamond,	Ives,
Lindley,	Ives,	James,
Lutie,	James,	Lindley,
Moore,	Lindley,	Lutie,
Niagara,	Lutie,	Meisch,
Worden,	Meisch,	Moore,
Winchell.	Moore,	Niagara,
	Niagara,	Scuppernong,
	Scuppernong,	Thomas,
	Thomas,	Worden,
	Worden,	Winchell.
	Winchell.	

QUINCES.

Meech Prolific,	Meech Prolific,	
Orange.	Orange.	

FIGS.

	Brown Turkey,	Brown Turkey,
	Celestial.	Brunswick,
		Celestial,
		Ischia (black),
		Ischia (white).

RASPBERRIES (RED).

Cuthbert,	Cuthbert,
Golden Queen,	Golden Queen,
King,	King,
Loudon,	Loudon,
Marlboro,	Marlboro,
Miller.	Miller.

RASPBERRIES (BLACK).

Eureka,	Eureka,
Gregg,	Gregg,
Kansas.	Kansas.

CURRANTS.

Cherry,
Fay,
Pomona,
Red Dutch,
White Dutch.

BLACKBERRIES.

Early Harvest.	Early Harvest.	Early Harvest.

DEWBERRIES.

	Lucretia.	Lucretia.

GOOSEBERRIES.

Mountain.	*Piedmont.*	*Coast.*
Downing,		
Houghton,		
Pearl,		
Red Jacket.		

STRAWBERRIES.

Bubach (imperfect),	Bubach (imp.),	Bubach (imp.),
Climax (perfect),	Climax (per.),	Climax (per.),
Excelsior (per.),	Excelsior (per.),	Excelsior (per.),
Gandy (per.),	Gandy (per.),	Gandy (per.),
Heflin (per.),	Heflin (per.),	Heflin (per.),
Lady Thompson (per.),	Lady Thompson (per.),	Lady Thompson (per.),
Nick Ohmer (per.).	Nick Ohmer (per.).	Nick Ohmer (per.).

CRAB APPLES.

Red Siberian,	Red Siberian,	
White Honey,	White Honey,	
Yellow Siberian.	Yellow Siberian.	

MULBERRIES.

	Black English,	Black English,
	Black Russian,	Black Russian,
	Hicks,	Hicks,
	New American,	New American,
	Stubbs,	Stubbs,
	White English.	White English.

PECANS.

		Curtis,
		Frotscher,
		Schley,
		Stuart,
		Van Deman.

POMEGRANATES.

	Purple Seeded,	Purple Seeded,
	Sweet.	Sweet.

JAPANESE PERSIMMONS.

		Okame,
		Tanenashi,
		Triumph,
		Zengi.

DESCRIPTION OF VARIETIES.

S. B. SHAW.

APPLES.

Albemarle (Yellow Newton):

Tree vigorous, productive under favorable conditions. Fruit medium, roundish, oblate; cavity regular, wide, obtuse, deep, russeted; basin wide, ribbed, medium deep. Calyx open. Surface greenish yellow, white and russet veinings; dots distinct, numerous, minute, russet. Flesh firm, crisp, juicy, yellow. Flavor rich, subacid. Very good. Late winter.

Astrachan. (See Red Astrachan.)

Arkansas (Mammoth Blacktwig):

Tree vigorous, spreading, productive. Fruit large, roundish, oblate, conical. Cavity regular, obtuse, russetted. Basin shallow, nearly smooth. Calyx closed. Surface yellowish, almost entirely covered with red; dots distinct, many, whitish. Flesh yellow, with yellow veinings, firm, juicy. Flavor mild, subacid. Core partly open; seeds few, plump, short. Very good. Winter.

Ben Davis:

Tree erect, hardy, vigorous, productive. Fruit medium, roundish, oblong, conical. Cavity deep, regular, acute, russeted; basin medium, almost regular. Calyx partly open. Surface smooth, yellow, almost entirely covered with bright and deep red splashes and stripes; dots distinct, minute, few, gray. Flesh white, firm, juicy. Flavor subacid. Good. Winter.

Baldwin:

Tree vigorous, upright, spreading, productive. Fruit medium large, roundish, conical. Cavity wide, regular, moderately deep; basin deep, narrow, generally plaited. Calyx large, partly closed. Surface rich yellow, nearly covered with red and striped with crimson; dots minute, russet or gray. Flesh yellowish white, crisp, juicy. Flavor good, subacid. Core closed. Seeds few, long, many imperfect. Very good. Winter.

Buckingham:

Tree upright, moderately spreading, productive. Fruit medium large, oblate, conical. Cavity broad, deep, slightly russeted; basin large, deep, slightly corrugated. Calyx closed. Surface greenish yellow, mostly covered with shaded stripes and splashes of red and crimson; dots numerous, light brown. Flesh yellowish, tender, juicy. Flavor mild, subacid. Core closed; seeds numerous, long, pointed. Very good. Fall.

Bonum:

Tree upright, spreading, hardy, productive. Fruit medium, regular, oblate. Cavity regular, wide, greenish russet; basin wide, shallow, slightly corrugated. Calyx closed. Surface yellow, mostly covered with red and crimson splashes; dots numerous, distinct, russet with dark center. Flesh white, often stained, firm, tender, juicy. Flavor aromatic, mild, subacid. Core small, closed. Seeds numerous. Very good. Autumn.

Belleflower. (See Yellow Belleflower.)

Chenango:

Tree vigorous, spreading. Fruit medium, oblong. Cavity regular, narrow, acute; basin narrow, shallow, smooth. Calyx partly closed. Surface yellowish white, almost covered with crimson stripes, sunny side thinly overlaid with whitish veinings; dots few, distinct, white, minute. Flesh white, tender, juicy. Flavor mild, pleasant, subacid. Core large, open; seeds flat, pointed. Very good. Late summer.

Colton (Early Colton):

Tree vigorous, upright, spreading. Fruit medium, roundish, slightly ribbed. Cavity narrow, regular, shallow; basin shallow, obtuse, wrinkled. Calyx partly open. Surface light greenish yellow, brownish red blush; dots large, numerous, greenish. Flesh whitish green, crisp, juicy. Flavor sprightly, subacid. Good. Summer.

Dula Beauty:

Tree vigorous, productive. Fruit large, oblate, conical. Cavity deep, obtuse, russeted; basin wide, shallow. Calyx open. Surface dark green, almost entirely covered with dark red, obscurely striped with red; dots few, obscure, whitish. Flesh yellowish white, tender, crisp, juicy. Flavor mild, subacid. Core medium, closed; seeds numerous, plump, pointed. Very good. Early winter.

Esopus (Spitzenburg):

Tree thrifty, erect, with drooping, slender limbs. Fruit large, round, oblong, conical. Cavity wavy, deep, wide, light brown; basin shallow, slightly furrowed. Calyx small, closed. Surface smooth, almost entirely covered with red, one side shaded, tinged with yellow; dots distinct, numerous, small, gray. Flesh firm, crisp, juicy. Flavor rich, spicy, subacid. Core open; seeds large, light-colored, flat. Best. Winter.

Early Harvest:

Tree fairly vigorous, erect, spreading, productive. Fruit medium, roundish, often oblate. Cavity wide, regular with russet patch; basin wide, shallow, smooth. Surface very smooth, clear yellow; dots few, minute, white and green. Flesh very white, tender, juicy, crisp. Flavor rich, subacid. Core small, closed; seeds few, large, pointed. Very good. Early summer.

Eckel (Sweet Red June):

Tree upright, productive. Fruit large, roundish, oblong. Surface red. Flesh white, crisp, juicy. Flavor sweet, aromatic. Good. Early.

Fallawater:

Tree vigorous, very productive. Fruit large, round, regular. Cavity regular, narrow, slightly russet; basin narrow, nearly flat. Calyx large, open. Surface yellowish green, shaded with dull red; dots large, distinct, numerous, gray. Flesh greenish white, crisp, tender, juicy. Flavor mild, subacid. Core open; seeds short, plump. Fair. Early winter.

Gano:

Tree erect, vigorous, productive. Fruit medium to large, regular, roundish. Cavity deep, regular, acute, russeted; basin smooth, more abrupt. Calyx

partly open. Surface smooth, dark, solid crimson; dots distinct, few, gray. Flesh white, firm, moderately juicy. Flavor pleasant, subacid, not rich. Core closed, medium; seeds large, long, pointed. Good. Late winter.

Gravenstein:

Tree vigorous, spreading, productive. Fruit large, roundish, oblate. Cavity acute, deep, angular, slightly russeted; basin angular, irregular, ribbed. Cavity closed. Surface bright yellow, striped and splashed with light and dark red and orange; dots obscure, few, gray, minute. Flesh yellow with yellow veinings, tender, juicy, crisp. Flavor aromatic, sprightly, subacid. Late summer.

Grimes Golden:

Tree erect, spreading, vigorous, productive. Fruit medium, regular, roundish, oblate. Cavity regular, medium, slightly russeted; basin abrupt, uneven. Calyx closed or partly open. Surface even, rich golden yellow; dots many, obscure, white. Flesh yellow, firm, crisp, juicy. Flavor rich, aromatic, spicy, subacid. Core small; seeds many, short, plump. Fine. Winter.

Golden Russet (New York):

Tree vigorous, spreading, productive. Fruit medium, roundish, oblong. Cavity medium; basin deep, regular, smooth. Calyx partly open. Surface greenish yellow, almost entirely russeted. Flesh greenish yellow, fine-grained, tender, juicy. Flavor rich, aromatic, subacid. Very good. Winter.

Gulley. (See Mangum.)

Hoover:

Tree erect, spreading, retains foliage late. Fruit medium, roundish, oblate. Cavity large, russeted; basin slightly furrowed. Calyx open. Surface yellowish, splashed and striped with two shades of dark red; dots distinct, light, patches of russet. Flesh yellowish, firm, tender, juicy. Flavor rich, subacid. Core small. Very good. Winter.

Horse:

Tree vigorous, productive. Fruit medium, roundish, oblate. Cavity deep, acute, russeted; basin abrupt, corrugated. Calyx closed. Surface yellow, shaded with red blush; dots few, sunken, large, gray. Flesh yellow, firm, coarse, tender. Flavor pleasant, subacid. Core large, partly open. Good. Late summer.

Jefferis:

Tree moderate grower, productive. Fruit medium, roundish, oblate, regular. Cavity large, regular, rather acute, slightly russeted; basin wide, smooth, abrupt, medium deep. Calyx closed. Surface clear waxen yellow, shaded and splashed with dark crimson; dots numerous, large, white. Flesh yellowish white, very juicy, tender. Flavor mild, aromatic, subacid. Core closed, small; seeds long, pointed, numerous. Very good. Late summer.

Jonathan:

Tree upright, spreading, vigorous, slender limbs. Fruit medium, roundish, oblong, conical. Cavity deep, regular, acute; basin deep, smooth, abrupt. Calyx small, closed. Surface smooth, clear, light yellow, almost covered with red, deepening into solid brilliant dark red on sunny side; dots distinct,

numerous, minute, white. Flesh white, sometimes stained wine color, very tender and juicy. Flavor mild, aromatic, spicy, subacid. Core closed; seeds plump, long, pointed. Best. Early winter.

Limbertwig (Red):

Tree hardy, productive, spreading, limbs drooping. Fruit medium, roundish, oblate, conic. Cavity deep, acute, thin green russet; basin small, shallow, uneven. Calyx small, nearly closed. Surface greenish yellow, shaded and striped with crimson; dots large, numerous, light brown. Flesh white, firm, juicy. Flavor brisk, subacid. Core closed; seeds numerous, large, plump. Good. Late winter.

Limbertwig (Royal):

Tree vigorous, spreading, drooping limbs. Fruit medium, large, oblate. Cavity deep, acute; basin shallow, small. Calyx closed. Surface greenish yellow, marked with red; dots numerous, brown. Flesh yellow, firm, juicy. Flavor poor, subacid. Good. Late winter.

Maiden Blush:

Tree vigorous, spreading, productive. Fruit roundish, oblate, medium. Cavity wide, deep, with trace of russet; basin wide, smooth. Calyx closed. Surface smooth, pale yellow, blushed with red next the sun. Flesh white, tender. Flavor pleasant, subacid. Core closed. Good. Early fall.

Mangum (Gulley):

Tree thrifty, productive. Fruit medium, oblate, conical. Cavity broad, russeted; basin shallow, corrugated. Calyx partly closed. Surface yellowish, striped and shaded with red; dots numerous, whitish or bronze. Flesh yellow, very tender, juicy. Flavor mild, subacid. Very good. Early fall.

Mattamuskeet:

Tree vigorous, productive. Fruit medium, roundish, oblate, conic. Surface yellow, shaded and splashed with light and dark red. Flesh whitish yellow, crisp. Flavor brisk, subacid. Good only in Eastern North Carolina. Late winter.

Mother:

Tree upright, rather slender, vigorous, productive. Fruit medium, roundish, conic. Cavity deep, acute, often a little russeted; basin small, corrugated. Calyx closed. Surface golden yellow, almost wholly covered with rich, warm red, splashed and striped with deeper red; dots numerous, minute, light russet. Flesh yellow, tender, juicy. Flavor rich, aromatic, subacid. Core medium, closed; seeds numerous. Best. Early winter.

Northern Spy:

Tree upright, spreading with age, productive. Fruit large, roundish, oblong, conical. Cavity wide, deep, sometimes russeted; basin narrow, abrupt, furrowed. Calyx small, closed. Surface smooth, greenish yellow, thinly covered with light and dark red stripes, overlaid with thin whitish bloom; dots obscure, few, yellow. Flesh white, fine-grained, tender, juicy. Flavor spicy, subacid. Core large, open; seeds numerous, short, plump. Very good. Winter.

Oldenburg (Duchess):

Tree hardy, upright, spreading. Fruit medium, regular, roundish, oblate; cavity deep, regular, acute; basin abrupt, regular. Calyx medium, closed.

Surface smooth, yellow, almost wholly covered with red stripes and splashes; dots white, numerous, minute. Flesh white, juicy. Flavor sprightly, subacid. Good. Late summer.

Red Astrachan:

Tree upright, vigorous, spreading, productive. Fruit medium, roundish, conical. Cavity shallow, regular, obtuse, russeted; basin shallow, smooth. Calyx small, closed. Surface smooth, greenish yellow, almost entirely covered with mottled and striped red crimson. Flesh white, crisp, moderately juicy. Flavor brisk, acid. Very good. Summer.

Red June:

Tree erect, vigorous, productive, hardy. Fruit medium size, irregular, roundish, oblong, conic; cavity narrow, regular, acute, with slight trace of russet; basin narrow, smooth or slightly corrugated. Calyx closed. Surface smooth, rich; dots minute, obscure. Flesh finely grained, white, tender, juicy. Flavor agreeable, subacid. Core rather large; seeds black-brown, numerous. Good. Early market.

Rome (Beauty):

Tree moderate grower, round-headed, productive. Fruit large, roundish, oblate, conical. Cavity wide, obtuse, lined with greenish russet; basin smooth, deep, abrupt. Calyx closed. Surface smooth, pale yellow covered with red, splashed and striped; dots distinct, abundant, russet. Flesh yellowish, tender, juicy. Flavor sprightly, subacid. Good. Early winter.

Roxbury (Russet):

Tree moderately vigorous, spreading, productive. Fruit medium, roundish, oblate. Cavity deep, regular; basin smooth, shallow, regular. Calyx closed. Surface green, entirely covered with network of brownish russet; dots obscure, few, gray. Flesh greenish white, moderately juicy. Flavor rich, subacid. Core closed; seeds pointed and plump. Very good. Late winter.

Shockley:

Tree vigorous, upright, very productive. Fruit medium, small, roundish, conical, regular. Cavity regular, acute, deep, russeted; basin shallow, narrow, corrugated. Calyx small, partly open. Surface very smooth, pale yellow, blushed with red and crimson; dots few, minute, obscure, gray. Flesh yellow, crisp, juicy. Flavor rich, mild, subacid. Core closed; seeds many, plump. Good. Winter.

Smith (Smith's Cider):

Tree vigorous, spreading, straggling, productive. Fruit medium, round, oblate, conical. Cavity deep, acute, russeted; basin broad, shallow. Calyx small, half open. Surface smooth, yellow, shaded and striped with red; dots few, distinct, large, gray. Flesh white, tender, juicy, crisp. Flavor aromatic, mild, subacid. Core open; seeds many, plump, pointed. Good. Late winter.

Smokehouse:

Tree moderately vigorous, spreading head. Fruit medium, round, oblate. Cavity wide, acute; basin wide, medium deep, corrugated. Calyx closed. Surface yellow, shaded and splashed with red and crimson; dots few, large, gray and brown. Flesh yellow, firm, juicy, crisp. Flavor aromatic, subacid. Very good. Winter.

Stark:

Tree vigorous, upright, spreading. Fruit roundish, conical. Cavity regular, obtuse, russeted; basin shallow, slightly wrinkled. Calyx closed. Surface yellowish green, overlaid with red streaks and splashes; dots numerous, distinct, brown and whitish. Flesh yellowish, crisp, moderately juicy. Flavor mild, subacid. Good. Late winter.

Stayman (Stayman Winesap):

Tree vigorous, open, irregular, spreading, productive. Fruit medium, oblong, conical. Cavity wide, deep, russeted; basin narrow, abrupt, shallow, furrowed. Calyx large, partially open, erect. Surface greenish yellow, mostly covered with indistinct red stripes and splashes. Flesh yellow, firm, tender, juicy. Flavor rich, mild, subacid. Core medium. Very good. Late winter.

Virginia Beauty:

Tree vigorous, spreading. Fruit medium, roundish, conical. Surface greenish yellow, streaked and striped with red and purple. Cavity regular, deep, russeted; basin shallow, broad. Calyx open; dots numerous, obscure, bronze. Flesh greenish yellow, firm, juicy. Flavor sweet. Very good. Late winter.

Williams:

Tree vigorous, productive. Fruit medium, roundish, oblong, conical. Cavity wide, shallow, slightly russeted; basin wide, shallow, abrupt, corrugated. Calyx closed. Surface very smooth, yellow, almost entirely covered with splashes and stripes of dark red; dots few, very minute. Flesh yellowish white, tender, moderately juicy. Flavor mild, aromatic, subacid. Core closed; seeds few, pointed. Good. Summer.

Winesap:

Tree moderately vigorous, open, straggling head, very productive. Fruit medium, roundish, oblong, conical. Cavity wide, regular, acute, russeted; basin narrow, shallow, corrugated. Calyx closed. Surface smooth, dark yellow, mostly covered with splashes and occasionally stripes of rich dark red; dots few, minute. Flesh yellow, firm, crisp, fine-grained. Flavor rich, sprightly, subacid. Core slightly open; seeds medium, few, short, plump. Very good. Late winter.

Yates:

Tree upright, productive. Fruit small, oblate, conic. Cavity large, slightly russeted; basin shallow. Calyx small, closed. Surface whitish yellow, shaded, striped and splashed with shades of red; dots numerous, small, light. Flesh white, sometimes stained next skin, tender, juicy. Flavor pleasant, subacid. Good. Late winter.

Yellow Transparent:

Tree vigorous, upright, round-headed, productive. Fruit medium, roundish, oblate, conical. Cavity regular, acute, russeted; basin narrow, shallow, corrugated. Calyx closed. Surface smooth, light yellow; dots numerous, large, white. Flesh white, tender, juicy. Flavor pleasant, subacid. Core half open. Good. Summer.

York Imperial:

Tree moderate grower, productive. Fruit medium, roundish, oblong, oblique. Cavity regular, narrow, acute, russeted; basin smooth, deep, abrupt, slightly

leather-cracked. Calyx closed or open. Surface light yellow, almost wholly covered with marbled, washed and striped red; dots few, distinct, gray. Flesh yellow, with yellow veinings, firm, crisp, juicy. Flavor pleasant, subacid. Core small, open; seeds many, plump. Good. Winter.

PEARS.

Anjou:

Tree productive. Fruit large, regular, oblong, pyriform. Cavity shallow, uneven; basin shallow, small, even. Calyx very small, open. Surface greenish yellow, dull red cheek and clouding russet; dots numerous, brown and crimson. Flesh yellowish white, melting. Flavor rich, vinous, perfumed. Best. Late.

Bartlett:

Tree upright, vigorous. Fruit large, oblong, obtuse, pyriform. Cavity shallow; basin shallow, obscurely plaited. Calyx open. Surface uneven, clear yellow, with blush on sunny side. Flesh white, fine grained, buttery. Flavor juicy, sweet, richly perfumed. Very good. Late summer.

Early Harvest:

Tree upright, vigorous. Fruit medium, regular, obovate. Cavity slight; basin shallow. Surface smooth, golden yellow, with bright red cheek. Flesh yellowish white, firm, juicy. Flavor mild, subacid. Good. Early. Very resistant of blight.

Flemish (Beauty):

Tree vigorous, hardy, upright. Fruit large, obovate, obtuse, pyriform. Cavity very narrow, deep, regular; basin small, round. Calyx open. Surface slightly rough, pale yellow, mostly covered with marblings and areas of light russet, becoming reddish brown at maturity. Flesh yellowish white, slightly coarse, juicy, melting. Flavor sweet, rich, slightly musky. Very good. Early fall.

Garber:

Tree hardy, upright, vigorous. Fruit large, roundish, oblate, pyriform. Surface brownish yellow, with red blush on sunny side. Flesh firm, granular, juicy. Flavor acid. Poor. Late summer. Very resistant of blight.

Howell:

Tree upright, vigorous. Fruit large, roundish, obovate, pyriform. Cavity narrow, shallow; basin broad, deep, uneven. Calyx open. Surface rich yellow, with traces of red in the sun; dots numerous, grayish. Flesh whitish, juicy, melting. Flavor brisk, vinous. Very good. Early fall.

Keiffer:

Tree hardy, vigorous, upright. Fruit large, oval, nearly obtuse, pyriform. Cavity medium; basin shallow, medium. Surface yellow, with brighter shade toward sun, patchings of netted russet. Flesh whitish, somewhat course, juicy, half melting. Flavor sweet when fully ripe. Good. Late fall. Very resistant of blight.

Le Conte:

Tree vigorous, upright. Fruit large, roundish, oblong, pyriform. Surface yellow, with red on sunny side. Flesh whitish, melting. Flavor fair. Midsummer. Very resistant of blight.

Magnolia:

Tree dwarfish, prolific. Fruit large, roundish, regular. Cavity shallow, acute, uneven; basin, regular, deep, acute. Calyx wanting. Surface smooth, yellow, russeted, tinged with red and brown on sunny side; dots numerous, obscure, russet. Flesh white, crisp, tender, juicy. Flavor mild, subacid. Early fall.

Seckel:

Tree hardy, vigorous, uniform, compact head. Fruit small, regular, obovate. Cavity slight; basin very shallow. Calyx small. Surface smooth, brownish green at first, becoming dull yellowish brown with russet red cheek. Flesh whitish, buttery, melting, very juicy. Flavor rich, spicy, aromatic. Best. Late summer.

Sheldon:

Tree vigorous, erect, hardy. Fruit large, roundish, obtuse, obovate. Cavity deep; basin broad, deep. Calyx open. Surface greenish yellow, with thin russet, slight blush where exposed. Flesh whitish, juicy, melting. Flavor sweet, vinous, aromatic. Very good. Fall.

Smith:

Tree hardy, productive. Fruit large, roundish, ovate. Surface yellow, with red blush where exposed. Flesh whitish yellow, tender, vinous. Flavor astringent, subacid. Good. Resistant of blight.

Winter Nelis:

Tree vigorous, productive. Fruit medium, obovate, sometimes pyriform. Cavity small, narrow; basin broad, deep. Surface greenish yellow, russeted. Flesh white, tender, juicy, buttery. Flavor rich, sweet. Very good. Late.

PLUMS.

Abundance:

Tree hardy, prolific. Fruit large, roundish, ovoid, unequal sides. Stem short and strong; suture distinct but shallow. Surface yellow, washed with purplish crimson; dots numerous. Flesh firm, meaty. Flavor pleasant, subacid. Good. Early.

Bradshaw:

Tree upright, vigorous. Fruit large, obovate, sometimes with neck. Stem stout, curved; suture broad, shallow, half round. Cavity small. Surface reddish purple, with light blue bloom. Flesh yellowish, changing to brownish purple when fully ripe, coarse, juicy. Flavor pleasant, subacid. Good. Late summer.

Chabot:

Tree upright, productive. Fruit large, oblong, conical. Stem short, stout. Cavity large, abrupt; suture not distinct. Surface yellow, almost covered with cherry-red blush, blue bloom. Flesh yellow, juicy. Flavor rich, sweet. Very good. Late summer.

Clifford:

Tree vigorous, productive. Fruit large, long, ovate; suture light. Surface bright scarlet; dots yellow; lilac bloom. Flesh yellow, firm. Flavor sweet, aromatic, vinous. Very good. Early summer.

Climax:

Tree vigorous, prolific. Fruit large, heart-shaped. Stem short, stout. Cavity deep, abrupt; suture distinct, shallow. Surface dark red, varied-sized yellow dots. Flesh yellow, firm. Flavor rich, sweet. Very good. Early summer.

Damson:

Tree hardy, prolific. Fruit small, oval. Surface purple, covered with thick blue bloom. Flesh melting and juicy. Flavor subacid. Good. Late summer.

Excelsior:

Tree thrifty, productive. Fruit medium to large, conical, flattened at top. Stem short. Cavity wide, shallow; no suture. Surface solid wine color. Bloom heavy, light blue; dots very small, white. Flesh yellowish, with reddish shade next pit, firm. Very good. Early.

Golden Beauty:

Tree hardy, productive. Fruit medium, roundish; suture distinct. Surface golden yellow, with white dots and white bloom. Flesh firm, meaty, bright yellow. Flavor mild, subacid. Good. Late summer.

Golden Drop (Coe's Golden Drop):

Tree moderately vigorous, productive. Fruit large, oval, short neck, unequal sides. Stem long, stout. Cavity shallow, abrupt; suture well marked, extending beyond apex. Surface golden yellow, with numerous yellow dots; bloom yellow. Flesh yellow, firm. Flavor rich, sweet. Very good. Late summer.

Hand (General Hand):

Tree vigorous, productive. Fruit large, roundish, oval. Stem medium, slender. Cavity broad, shallow; suture shallow. Surface golden yellow, with marbling of greenish yellow; dots small; bloom light colored. Flesh yellow, not firm, juicy. Very good. Summer.

Imperial Gage:

Tree thrifty, prolific. Fruit medium to large, oval. Stem one inch long, stout. Cavity obtuse, flattened on top. Surface pale green, with tinge of yellow; bloom white. Flesh greenish, juicy, melting. Flavor rich. Best. Summer.

Kerr:

Tree vigorous, productive. Fruit medium, conical; suture deep. Surface orange yellow; bloom cream-colored. Flesh juicy. Flavor rich, sweet. Not susceptible to rot. Good.

Lombard:

Tree vigorous, productive, peculiar crimpled leaves. Fruit medium, roundish, oval, slightly flattened at ends. Stem short, slender; suture shallow. Cavity broad, abrupt. Surface violet red, with blue bloom; dots whitish. Flesh yellow, juicy. Flavor pleasant, subacid. Good. Late summer.

Miner:

Tree hardy, productive when planted with other varieties. Fruit medium, roundish, oblong. Surface dull purplish red; dots numerous, small, yellow and gray. Flesh amber-colored, soft, juicy. Flavor rich, vinous. Good. Early fall.

Munson:

Tree thrifty, moderately prolific. Fruit medium, long, oval. Surface yellow, covered with red; dots numerous, yellow; bloom lilac. Flesh yellow, very soft. Flavor sweet. Good. Early summer.

Ogon:

Tree vigorous, productive. Fruit medium, roundish, irregular. Stem short. Cavity regular; suture well defined. Surface lemon yellow; dots numerous; bloom white. Flesh yellow, firm, meaty. Good, not susceptible to rot. Summer.

Red June:

Tree vigorous, productive. Fruit medium to large, roundish, conical. Stem medium. Cavity large, regular, deep; suture distinct to apex. Surface deep vermilion red, sometimes marbled with purple; dots numerous, small, light-colored. Flesh light, yellowish white, veined, firm, tender, juicy. Flavor mild, subacid. Good. Early.

Washington (Lady Washington):

Tree vigorous, productive. Fruit very large, roundish, oval. Stem ¾-inch long. Cavity wide, shallow; suture obscure except near cavity. Surface bright yellow, sometimes marbled with green. Flesh yellow, firm. Flavor sweet. Very good. Summer.

Weaver:

Tree productive, thrifty. Fruit large, oblong, flattened at ends. Stem medium. Cavity shallow, regular; suture well defined. Surface dark marbled red; bloom purplish. Flesh firm, meaty. Very good. Summer.

Wickson:

Tree vigorous, upright, productive. Fruit large, heart-shaped. Stem short, stout; suture distinct. Cavity abrupt. Surface dark red, with bluish bloom; dots numerous, yellow. Flesh yellow, firm. Flavor delicious. Good. Summer.

Wildgoose:

Tree vigorous, very productive. Fruit medium to large, roundish, oblong. Surface light red, attractive appearance. Flesh yellow, meaty, juicy. Flavor rich, sweet. Very good. Summer.

PEACHES.

Belle of Georgia:

Tree hardy, productive. Fruit large, roundish, oblate. Surface whitish, with red cheek. Flesh white, firm. Flavor excellent. Pit free. Very good. Summer.

Bilyeu:

Tree hardy, productive. Fruit large, roundish. Surface greenish white, with red cheek. Flesh white, firm, crisp. Flavor sweet. Pit free. Good. Early fall.

Carman:

Tree strong, prolific. Fruit large, broadly oval, pointed. Surface white, dotted and blushed with red. Flesh creamy white, tinged with red. Flavor vinous, sprightly. Pit free. Good. Early.

Chairs (Chairs Choice):

Tree vigorous, productive. Fruit large, roundish, oval. Cavity deep, narrow; suture extending beyond apex. Surface yellow, with blush next the sun. Flesh yellow, red at pit. Flavor acid. Pit free. Very good. Late summer.

Champion:

Tree vigorous, spreading, productive. Fruit large, roundish, regular. Cavity shallow; suture distinct, extending two-thirds around. Surface yellowish white, mottled with red on sunny side. Flesh whitish, red at pit, tender, juicy. Flavor rich, subacid. Very good. Summer.

Chinese Cling:

Tree vigorous, productive. Fruit large, roundish, somewhat elongated. Suture shallow. Surface pale yellow, shaded with fine red. Flesh white, with red at pit, juicy, melting. Flavor rich, vinous. Pit not free. Good. Summer.

Connett:

Tree prolific, hardy. Fruit large, roundish, oval. Cavity deep, abrupt. Suture extends beyond apex. Surface creamy white, mottled with red next the sun. Flesh yellowish white, without red, tender, juicy. Flavor excellent. Pit not free. Very good. Summer.

Crawford's Early (Early Crawford):

Tree vigorous, hardy, prolific. Fruit large, roundish, elongated. Suture compressed, extending two-thirds around. Cavity broad but shallow. Surface bright yellow, with red cheek. Flesh yellow, juicy, colored at pit. Flavor sweet, rich. Pit free. Very good. Late summer.

Crawford's Late (Late Crawford):

Tree hardy, prolific. Fruit very large, roundish, oval. Distinct suture. Surface yellow, with red blush next sun. Flesh yellow, with red at pit, juicy, melting. Flavor rich, excellent, vinous. Pit free. Very good. Fall.

Crosby:

Tree hardy, productive. Fruit medium, roundish. Cavity narrow, deep; suture two-thirds around fruit. Surface yellow, with mottlings of red and red cheek, and some bloom. Flesh yellow, juicy, quite firm. Pit free. Very good. Late summer.

Elberta:

Tree strong, prolific. Fruit large, roundish, oval, slightly compressed. Suture more than half around. Surface yellow, with red cheek. Flesh yellow, with red at pit, tender, juicy. Flavor rich, sweet. Pit free. Very good. Summer.

Greensboro:

Tree vigorous, hardy. Fruit large, round. Surface yellow, with red and crimson cheek. Flesh white, very juicy. Flavor sweet. Pit free. Good. Early summer.

Hale:

Tree hardy, productive. Fruit medium, round. Cavity abrupt, deep. Suture extends to apex. Surface creamy white, with red cheek and light bloom. Flesh white, tender, juicy. Flavor rich, sweet. Pit not free. Good. Early summer.

Heath:

Tree vigorous, prolific. Fruit large, oblong, narrowed at both ends. Cavity shallow; suture distinct, extending to apex. Surface yellowish white, with red cheek. Flesh white, firm, tender, melting. Flavor vinous, subacid. Very good. Pit not free. Late summer.

Ingold:

Tree vigorous but not hardy, productive. Fruit medium, roundish, irregular. Cavity shallow; suture distinct. Surface deep yellow, with red cheek, almost entirely covered with minute dots and shadings of red. Flesh yellow, red at pit, firm, juicy. Flavor rich, melting, subacid. Pit free. Very good. Summer.

Mathews (Beauty):

Tree vigorous, productive. Fruit large, roundish. Cavity narrow. Suture obscure. Surface golden yellow, red-streaked, crimson cheek. Flesh yellow, firm, juicy. Flavor rich, subacid. Pit free. Good. Late summer.

Mayflower:

Fruit medium, oblong. High color, excellent quality. Very early. New.

Mountain Rose:

Tree thrifty, prolific. Fruit large, roundish. Cavity abrupt, deep. Suture slightly depressed, extending beyond apex. Surface creamy white, blushed and sprinkled with red spots. Flesh white, with red at pit, tender, melting. Flavor rich, subacid. Pit free. Good. Summer.

Reeves:

Tree hardy, productive. Fruit medium to large, roundish, ovate. Cavity deep, broad; suture not distinct. Surface yellow, dark red cheek; thin bloom. Flesh yellow, red at pit, tender, juicy. Flavor mild, vinous, subacid. Pit free. Good. Late summer.

St. John:

Fruit large, round. Surface yellow, with red cheek. Flesh juicy, firm. Flavor rich, sweet. Pit free. Very early.

Salway:

Tree vigorous, productive. Fruit large, roundish, somewhat oval, one side enlarged. Suture slight, extending beyond apex. Surface creamy yellow, crimson blush next sun. Flesh yellow, with red at pit, juicy, tender. Flavor vinous. Pit free. Good. September.

Smock:

Tree vigorous, productive. Fruit large, roundish, ovate. Cavity narrow, deep. Suture obscure, except near apex. Surface orange yellow, with blush on cheek; bloom heavy. Flesh yellow, red at pit, quite tender, juicy. Flavor rich, sprightly, subacid. Pit free. Good. Late summer.

Sneed:

Tree hardy, prolific. Fruit medium, roundish, ovate. Cavity narrow and deep. Suture obscure. Surface yellow, with slight blush on cheek; heavy bloom. Flesh yellowish white, tender. Flavor excellent. Pit nearly free. Good. Early.

CHERRIES.

Black Tartarian:

Tree vigorous, erect. Fruit very large, heart-shaped. Stem 1½ inches long. Cavity shallow. Surface often uneven. Skin glossy, bright purplish black. Flesh colored, half-tender. Flavor rich, sweet, delicious. Stone small. Very good. Early summer.

Black Eagle:

Tree vigorous, moderately productive. Fruit medium, obtuse, heart-shaped. Stem medium, slender. Cavity shallow. Surface dark, purple to black. Flesh deep purple, tender, juicy. Flavor rich, vinous, sweet. Best. Early summer.

Dychouse:

Tree hardy, prolific. Fruit medium, oblate. Apex depressed. Cavity narrow, abrupt. Stem 1¾ inches long. Skin light red. Flesh uncolored, firm. Flavor acid. Fair. Early.

Early Richmond:

Tree hardy, productive, erect, roundish, spreading head. Fruit medium, round. Stem one inch long. Cavity broad, sloping. Apex depressed. Suture well defined. Skin light red. Flesh soft, uncolored. Flavor rich, acid. Very good. Early.

Governor Wood:

Tree vigorous, round, regular head. Fruit large, heart-shaped. Stem one and one-half inches long. Cavity broad, shallow. Suture well defined. Skin yellow, shaded with red. Flesh tender, juicy. Flavor rich, sweet, delicious. Best. Middle of June.

May Duke:

Tree thrifty, erect, productive. Fruit roundish, obtuse, heart-shaped. Stem one to one and one-quarter inches long. Cavity shallow. Surface bright red, becoming darker. Flesh lightly colored, tender, melting. Flavor rich, subacid. Very good. Quite early.

Montmorency:

Tree erect, hardy, productive. Fruit large, roundish, oblate. Stem one and one-quarter inches long. Cavity deep. Skin reddish amber. Flesh tender, uncolored. Flavor mildly acid. Good. Early summer.

Morello:

Tree very hardy, productive. Fruit medium, roundish, flattened at ends. Stem three-quarters inch long. Cavity broad, deep. Apex slightly compressed. Surface bright red. Flesh light-colored, juicy. Flavor brisk, acid. Very good. Early.

Napoleon:

Tree vigorous, productive. Fruit very large, heart-shaped, a little oblong. Stem short. Cavity narrow. Skin pale yellow, dotted with red and marbled crimson on sunny side. Flesh firm, juicy. Flavor excellent. Good. Summer.

Reine Hortense:

Tree hardy, productive. Fruit very large, roundish, elongated. Suture a distinct line on even surface. Surface bright red, marbled and mottled. Flesh tender, juicy. Flavor mild, subacid. Best. Late.

Windsor:

Tree hardy, prolific. Fruit large, round, obtuse, heart-shaped. Stem one and one-half inches long. Cavity deep. Skin dark red. Flesh yellowish with red tint, firm, juicy. Flavor rich, sweet. Good. Late.

Wragg:

Tree strong, hardy, productive. Fruit large, roundish, heart-shaped. Stem one and one-half inches long. Cavity small, shallow. Skin dark crimson. Flesh and juice light crimson, firm, juicy. Flavor slightly astringent. Good. Summer.

Yellow Spanish:

Tree strong, spreading, prolific. Fruit large, obtuse, heart-shaped. Stem one and one-half inches long. Cavity wide, shallow. Skin light yellow, blush and dots on side next sun. Flesh firm, light yellow. Flavor rich.

GRAPES.

Agawam:

Vine vigorous, productive. Bunch large, compact, shouldered. Berry large, roundish, oval. Skin dark red. Flesh tender, juicy. Flavor vinous, with trace of native aroma. Good. After Concord.

Brighton:

Vine strong, productive. Bunch medium to large, compact, shouldered. Berry medium. Skin dark red. Flesh tender. Flavor rich, sweet. Very good. Requires mixed planting. Earlier than Delaware.

Brilliant:

Vine hardy, prolific. Bunch large, conical, shouldered, compact. Berry medium, roundish. Skin brownish black. Flesh and skin very tender, juicy. Flavor sweet, vinous. Very good. Before Concord.

Catawba:

Vine hardy, productive. Bunch medium, shouldered, not very compact. Berries quite large, roundish, often oval. Skin pale red in shade, deeper red in sun, lilac-colored bloom. Flesh pulpy, juicy. Flavor rich, sweet, slightly musky. Good. Early fall.

Concord:

Vine very healthy, vigorous, productive. Bunch compact, large, shouldered. Berry large, globular. Skin almost black, thickly covered with bloom. Flesh buttery, juicy, tough near center. Flavor sweet. Very good. Late summer.

Delaware:

Vine vigorous, hardy, productive. Bunch small, very compact, usually shouldered. Berries small, round. Skin handsome light red. Flesh tender. Flavor rich, sweet, aromatic. Best. Summer. Very resistant of rot.

Diamond:

Vine vigorous, productive. Bunch long, shouldered, compact. Berries round, medium. Skin greenish white, with white bloom. Flesh juicy, tender. Flavor sweet, vinous. Very good. Summer.

Flowers:

Of Muscadine class. Bunches have from fifteen to twenty-five berries; black skin; sweet, vinous flavor. A month later than the Scuppernong.

Ives:

Vine vigorous, productive. Bunch medium, compact, shouldered. Berries medium, roundish, oval. Skin black. Flesh juicy, pulpy. Flavor sweet, quite foxy. Good. Early.

James:

Of Muscadine class. Vine hardy, prolific. Bunches small, irregular. Berries very large, round. Skin black, slight bloom, thick. Flesh firm, juicy. Flavor sweet, aromatic, vinous. Very good. September.

Lindley:

Vine vigorous, very productive. Bunch large, long, compact. Berries medium, round. Skin pale yellow, violet bloom. Flesh tender, juicy. Flavor sweet, slightly aromatic. Very good. Needs mixed planting. Summer.

Lutie:

Vine strong, very productive. Bunch medium, long, roundish, compact. Berries large, round, pale to dark red, thin bloom. Flesh tender, juice uncolored. Flavor aromatic, foxy odor. Early.

Meisch:

Of Muscadine class. Vine vigorous, productive. Bunch medium, not compact. Berries medium, roundish. Skin black, slight bloom. Flesh juicy. Flavor sweet. Good. Late.

Moore:

Vine hardy, productive. Bunch smaller than Concord, roundish, conical, rarely shouldered, compact. Berries large, round. Skin black, bloom thin. Flesh firm, juicy. Flavor vinous, slightly foxy. Good. Summer.

Niagara:

Vine very hardy, strong grower. Bunches large, compact, shouldered. Berries large, round. Skin yellowish white. Flesh juicy. Flavor vinous, sprightly. Very good. Summer.

Scuppernong:

Of Muscadine class. Vine hardy, productive. Bunches very small. Berries large, round. Skin greenish yellow, sometimes sprinkled with red and patches of russet, thick. Flesh firm, juicy. Flavor rich, sweet, aromatic, musky, slightly perfumed. Very good for local consumption. Late summer.

Thomas:

Of Muscadine class. Vine vigorous, productive. Bunches very small. Berries medium, round. Skin reddish purple. Flesh pulpy, tender. Flavor sweet. Good. Late summer.

Winchell:

Vine vigorous, productive. Bunch medium, compact, long, shouldered. Berries small, round. Skin greenish yellow, with slight bloom. Flesh juicy, tender. Flavor rich, sweet. Very good. Early.

Worden:

Vine vigorous, prolific. Bunch large, long, compact, shouldered. Berries large, round. Skin black. Flesh greenish, pulpy, juicy. Flavor vinous, pleasant. Good. Summer.

QUINCES.

Meech Prolific (Meech):

Tree hardy, prolific. Fruit large, obscure pyriform. Surface bright yellow. Flesh, flavor and quality very good, particularly fragrant. Early.

Orange:

Tree vigorous, prolific. Fruit large, roundish. Surface orange color. Flesh, flavor and quality good, particularly fine for preserving. August.

FIGS.

Black Ischia:

Bush hardy, productive. Fruit medium, turbinate, flat at top. Surface deep purple. Flesh deep red. Flavor luscious, sweet. Good.

Brown Turkey:

Bush hardy, prolific. Fruit large, pear-shaped, thick stem. Surface dark brown, with blue bloom. Flesh red. Flavor luscious. Good.

Brunswick:

Fruit very large, broadly pear-shaped, short, slender stalk, ribs well marked. Eye large, open, with rosy scales. Skin tough, dark brown in color, with violet shade. Flesh amber-colored, thick, soft. Very good. Early.

Celestial (Blue Celeste):

Bush hardy, productive. Fruit very small, ovate. Surface dark violet amber, with bloom at neck. Flesh amber-colored. Flavor sweet. Good.

White Ischia:

Bush vigorous, prolific. Fruit small, round; neck small; stem short. Eye open. Surface smooth, bluish green, brown blush. Flesh rosy red. Good.

RASPBERRIES (RED).

Cuthbert:

Bush hardy, very productive. Fruit large, roundish, conical. Surface scarlet crimson. Flesh firm, juicy. Flavor mild, subacid. Best.

Golden Queen:

Bush vigorous, productive. Fruit medium, roundish, conical. Surface yellow. Flesh soft, juicy. Flavor sweet. Very good.

King:

Bush strong, prolific. Fruit medium, roundish. Surface red. Flesh firm. Flavor mild, sweet. Good.

Marlboro:

Bush small, hardy, productive. Fruit large, roundish, conical. Surface crimson. Flesh firm, juicy. Flavor subacid. Good.

Miller:

Bush vigorous, productive. Fruit large, roundish. Surface bright crimson. Flesh firm, juicy. Flavor sprightly, subacid. Good.

Loudon:

Bush vigorous, productive. Fruit medium, roundish, conical. Surface bright red. Flesh firm, juicy. Flavor rich, subacid. Very good.

RASPBERRIES (BLACK).

Eureka:

Bush vigorous, hardy, productive. Fruit medium, roundish. Surface black. Flesh quite firm, juicy. Flavor mild, subacid. Good.

Gregg:

Bush hardy, prolific. Fruit large, roundish, oblate. Surface black, with gray bloom. Flesh firm, juicy. Flavor pleasant, subacid. Very good. Late.

Kansas:

Bush hardy, sprawly. Fruit large, roundish. Surface shining black, with slight bloom. Flesh firm. Flavor subacid. Good.

CURRANTS.

Cherry:

Plant strong, stout, erect. Clusters short. Berries large, round. Color red. Flesh firm. Flavor quite acid. Very good.

Fay:

Plant hardy, upright. Clusters medium. Berries large, round. Color red. Flesh firm. Flavor acid. Good.

Pomona:

Plant vigorous, productive. Clusters medium. Berries medium, round. Color bright red. Flesh tender. Flavor subacid. Good.

Red Dutch:

Plant thrifty, upright, productive. Clusters medium long. Berries large, round. Color red. Flesh firm. Flavor acid. Good.

White Dutch:

Plant hardy, erect, productive. Clusters medium long. Berries large, round. Color yellowish white. Flesh tender, mild, subacid. Very good.

GOOSEBERRIES.

Downing:

Plant upright, vigorous, productive. Fruit medium, roundish, oval. Color green, with distinct rib veins and smooth skin. Flesh quite soft, juicy. Flavor subacid, mild. Very good.

Houghton:

Plant vigorous, branches rather slender, drooping. Fruit small, roundish, oval. Color light green, shaded red. Flesh tender, juicy. Flavor sweet. Very good.

Pearl:

Plant hardy, prolific. Fruit medium to large, roundish. Color light green, with shading of red. Flesh firm. Flavor subacid. Very good.

Red Jacket:

Plant vigorous, productive. Fruit medium, roundish, oval. Color light green, shaded with red. Flesh tender, juicy. Flavor rich, subacid, mild. Very good.

BLACKBERRIES.

Early Harvest:

Fruit medium, roundish, oblong. Surface greenish black. Flesh soft, juicy. Flavor rich. Good. Early.

DEWBERRIES.

Lucretia:

Fruit very large, oblong, ovate. Flesh tender, juicy, almost melting. Good.

STRAWBERRIES.

Bubach:

Fruit large, conical, irregular. Surface dark red or crimson. Good. Pistillate. Early.

Excelsior:

Fruit medium, roundish, slightly conical. Surface bright red. Flesh firm. Very good. Flowers perfect. Very early.

Gandy:

Fruit large, regular, conical. Surface glossy crimson. Flesh firm. Very good. Flowers perfect. Late.

Heflin:

Fruit large, uniform. Surface glossy crimson. Flesh firm. Very good. Flowers perfect. Early.

Lady Thompson:

Fruit large, conical, regular. Surface crimson and red. Flesh quite firm. Very good. Flowers perfect. Early.

Nick Ohmer:

Fruit very large, roundish, conical, often three-sided. Surface glossy red. Flesh firm. Good. Flowers perfect.

CRAB APPLES.

Red Siberian:

Tree upright, vigorous, productive. Fruit medium, three-fourths inch in diameter, regular, roundish, flattened at ends. Stem long, slender; cavity smooth, shallow; basin slight, calyx small. Surface smooth, bright scarlet over clear yellow ground. Flesh yellowish white, firm, juicy. Flavor brisk, aromatic, acid. Very good. Late summer.

Yellow Siberian:

Tree vigorous, prolific. Fruit small, roundish, flattened at ends, angular, irregular. Stem long; cavity regular, obtuse; basin flat, wrinkled; calyx closed. Surface smooth, rich yellow. Flesh yellow, juicy. Flavor acid. Good. Late summer.

MULBERRIES.

Black English:

Tree large, vigorous, upright, productive. Fruit medium, oblong, slightly curved. Stem one-half inch long, slender. Apex rounded; base oblique, irregular. Druplets flat to circular in outline, compact, firm; sutures shallow, narrow. Surface reddish, becoming black. Flavor sweetish. Fair. Early summer.

Black Russian:

Tree vigorous, small, productive. Fruit medium, short, oval. Stem stout, small. Apex blunt, obtuse; base oblique, irregular. Druplets large, broad, rounded, irregular, compact; sutures deep, open. Surface black. Flavor sweet, slightly subacid. Good. Early summer.

Hicks:

Tree large, vigorous, productive. Fruit medium, oblong, sometimes curved. Stem medium, slender. Apex rounded; base oblique or rounded. Druplets medium, flattened, compact. Sutures narrow, shallow. Surface reddish, becoming black. Flavor sweet, insipid. Poor. Summer.

Stubbs:

Tree large, vigorous, prolific. Fruit large, oblong, curved, irregular. Apex rounded; base oblique, irregular. Druplets compact, flattened, medium. Sutures shallow, narrow. Flavor subacid, vinous, sharp. Good. Summer.

White English:

Tree vigorous, spreading. Fruit medium, oblong, curved. Stem long, slender, curved. Apex rounded; base oblique. Druplets medium, flattened, narrow, compact. Sutures narrow, deep. Flavor sweet. Good. Early summer.

PECANS.

Curtis:

Tree vigorous, productive. Nut medium, oblong, conical. Shell thin; partitions thin. Kernel plump, full. Excellent.

Frotscher:

Tree vigorous, productive. Nut large, oblong-ovoid. Shell quite thin; partitions thin. Kernel plump, full. Excellent. Early.

Schley:

Tree thrifty, productive. Nut medium, oblong-ovoid, flattened. Shell very thin; partitions thin. Kernel plump, sweet, rich. Very good. Early.

Stuart:

Tree thrifty, prolific. Nut large, ovoid. Shell thin; partitions thin. Kernel plump. Flavor good. Early.

Van Deman:

Tree vigorous, productive. Nut large, oblong, pointed. Shell thin; partitions rather corky. Kernel rather plump. Good. Early.

POMEGRANATES.

Purple Seeded:

Fruit large, oval, yellow, with red and purple shading. Very good.

Sweet:

Fruit large, round, dark red with deeper shading. Good.

JAPANESE PERSIMMONS.

Okame:

Large, roundish, oblate, netted lines at apex. Surface orange yellow, changing to carmine, with bloom and waxy expression. Flesh light-colored, light-brown center around the seeds. Good.

Tane-Nashi:

Large, roundish, conical, pointed at apex. Surface light yellow, changing to bright red. Flesh yellow. Seedless. Fine.

Triumph:

Medium, tomato-shaped. Surface yellow. Seeds few. Very good.

Zengi:

Small, round or oblate. Surface light, with reddish shades. Flesh dark brown with darker spots. Flavor very sweet. Good. Late summer.

DEWBERRIES—PRELIMINARY REPORT.

F. C. Reimer.

INTRODUCTION.

This is a preliminary bulletin on the dewberry. It is not intended as a final treatise on the subject. The writer is giving the subject of dewberries considerable study, is carrying on a number of experiments with them, and expects to publish more fully on certain phases of the subject at a later date.

An excellent crate of Lucretia Dewberries ready to be closed for shipment.

The reasons for putting out this preliminary bulletin are that considerable interest is now being taken in the subject by many of our people, and that many immigrants are coming into the State, some of whom wish to take up the culture of dewberries, but know little about local conditions. In some instances beginners have failed in growing this crop, and it seems proper at this time to put out a preliminary bulletin covering the main points of dewberry cul-

ture as fully as possible for the benefit of these people. Primarily, this bulletin is not intended for those who have been in the business for a number of years.

GENERAL DISCUSSION.

The dewberry is becoming an important crop in this State. It is being grown extensively in four or five different sections and on land which in most instances is not suited to many other crops. The profits realized have on the average been very good. In several sections this crop is bringing thousands of dollars into the community where formerly there was no horticultural industry. A plantation, when well established and cared for, will last for at least ten or fifteen years, and when properly handled will last for a much longer time. It requires only two years to establish a plantation, and a fair crop is obtained the second year. When once established, the yield should be at least one hundred crates per acre, and the profits during good seasons about one hundred dollars per acre. There are instances on record where the profits have been considerably higher than that, in some cases running as high as one hundred and fifty dollars per acre. There is considerable land in this State to be bought for five dollars per acre, which is yielding the owners very little profit, and which could be made more profitable by growing dewberries.

The dewberry industry, at the present time, is centered in Moore, Cumberland, Columbus and Warren counties, and a limited acreage is being grown in other portions of the eastern part of the State.

This crop can be successfully grown in any portion of the eastern part of the State, including the coastal-plain section, the sand-hill region, and portions of the lower Piedmont. The sandy soils seem to be especially well adapted to this crop. It cannot be successfully grown on low, wet or marshy soils.

The dewberry-picking season immediately follows the strawberry season, the bulk of the crop being shipped in June. This is an important matter, since it offers less competition on the market and there is little difficulty in securing refrigerator cars for shipping purposes.

While the dewberry is grown in this State principally as a commercial fruit, the fact should be emphasized that wherever possible it should also be grown for home use. It is an excellent fruit in its fresh state, splendid for canning purposes, and for jelly and jams is not excelled by any other fruit. Its season is earlier than the earliest blackberries, and continues for a long time. The blackberry is somewhat difficult to grow in the eastern half of this State, where the dewberry grows to perfection. It is a fact that altogether too little fruit is grown for home use in this State. This most excellent fruit should be found in every home garden.

Record Dewberry Field of North Carolina, owned by Mr. M. M. McKeithen, Cameron, N. C. Yield 252 crates per acre in 1906.

[PLATE II.]

Heavy fruiting of Lucretia. Trained to single wire.

ESTABLISHING A DEWBERRY FIELD.

SOILS.

Types of Soils.—The dewberry can be grown on a variety of soils. It does best on a soil that contains a large amount of sand. Even the poorest white sands of the sand-hill section, when properly handled, will yield excellent crops.

Usually, however, a sandy loam will give better results than a sandy soil. Sandy soils offer the drainage and warmth which seem to be essential to the dewberry, but such soils are very poor—that is, contain little plant food, suffer badly during a drought, hold very little water, and are less satisfactory than the sandy loams. A sandy loam contains sufficient sand to provide necessary drainage, enough clay and vegetable matter to make the soil richer in plant food, and at the same time hold more moisture.

The ideal soil is a sandy loam with a clay subsoil, not deeper than about two feet. In all the dewberry sections of the State the best crops are produced on sandy loams underlaid with a clay subsoil, which varies in depth from six to twenty-four inches. These soils contain more plant food, and the subsoil prevents it from washing down into the lower layers of soil, where it is out of reach of the roots. Large amounts of fertilizer are used in dewberry growing, and the soils which are most retentive are therefore best.

Moisture.—The dewberry will not endure a very wet soil, yet the crop requires a large amount of moisture. This is especially true while the fruit is developing and ripening. It must always be kept in mind that the berry is composed largely of water, and this at once shows the necessity of plenty of moisture in the soil. On poor, open, sandy soils it is often difficult and sometimes almost impossible to supply the crop with enough moisture while the fruit is ripening. Thorough cultivation is, of course, the greatest remedy. Often the size of the fruit can be doubled by frequent cultivation at this time. A sandy loam soil underlaid with a clay subsoil is most retentive of moisture.

Humus.—Another important factor in retaining moisture is humus. Humus is decaying vegetable matter, such as leaf mould, compost, stable manure, and cowpeas. In an open, porous soil humus tends to fill up the spaces between the soil grains and helps to make such soils more compact. The humus itself acts like a great sponge, absorbing large quantities of water, and during a drought will help to retain it much better than a soil without humus. In many soils humus is quite as important as cultivation.

Drainage.—Dewberry fields should always be thoroughly drained. There are places in the State where dewberry plants are dying, and the only cause, as far as can be determined, is a soggy soil. A number of plants examined in these fields show that the roots are actually rotting. The water excludes air from the soil and tends to smother the roots. In the same fields where the soil is well drained this condition does not exist, and as the soil is rich and moist the plants are growing luxuriantly and yielding excellent crops. The remedy, of course, would be to drain thoroughly those portions of the field which are too wet. It is a waste of time and money to plant dewberries in a low, wet soil. Many of these soils, however, are excellent when well drained.

PREPARATION OF SOIL.

Most of the soils in this State which are well adapted to dewberry growing contain a very small amount of plant food and little or no humus. These soils must be greatly improved if the best results are to be obtained. Plant food and humus must be supplied in some form. If this can be done before the plants are set out, so much the better. In preparing the soil for the dewberry crop it is well to begin two or three years before planting. By a rotation of crops and by using legumes—for example, cowpeas or crimson clover—the land can be very much improved, and if these crops are turned into the soil a large amount of humus is also added. Some of the poorest soils, when treated in this way, will yield good crops of dewberries.

The land is prepared every season for annual crops. The dewberry is a perennial plant and occupies the land for at least ten years; hence, the preparation of the land must be more thorough than that for annual crops, like corn and cotton. Plowing should be very deep, and if the land is underlaid with a clay subsoil which comes near the surface, it becomes necessary to use a subsoil plow to break up this hard layer. This is for the purpose of giving depth to the soil, so that it will supply a greater feeding surface to the roots, will offer better drainage, and during a drought will help to retain the moisture. If the soil is at all rough it should be thoroughly pulverized before planting; this can be done with a heavy roller. Usually, however, this condition does not exist in most of our dewberry sections.

PROPAGATION.

The dewberry is easily propagated, two methods being commonly employed.

Tip Layers.—This method is generally employed in this State in propagating the dewberry, and usually it is the most satisfactory. It is quite easily performed. The tips of the long vines are covered with soil in the fall, and, as soon as they have formed a good root system, are ready to be cut off from the parent plant and planted in the field, where they are to remain permanently. Usually we have found it very satisfactory to cover them in September, and then transplant them in December. This gives a good opportunity for fall planting. Many growers do not transplant them until early the following spring—some time during March. In that case it is not necessary to cover them until later in the season—say October or early November. This has the advantage of allowing the vines to grow later in the fall before the tips are covered.

It is best for this purpose to select good, strong, healthy plants, and from these plants select the strongest vines, and also those freest from disease or bruises of any kind. This will give better results in the new plantation.

The importance of selection in growing dewberry plants is often overlooked. Many growers will cover up almost any vine, and the more vines that can be covered up, the better. This is a bad practice. We know that the offspring will be very much like the parent from which it came. If the parent produces little or poor fruit, is a poor grower and a sickly plant, the offspring in nearly every instance will possess these same characteristics. This is because the young plant comes from a portion of the old plant—a portion of the stem.

To secure the very best results it is necessary to go into the field while the fruit is still on the vines and mark in some way those plants that come nearest

[PLATE III.]

Cluster of fine Lucretia Dewberries. Natural size.

[PLATE IV.]

Cluster of Lucretia Dewberry Flowers and Buds.

to the grower's ideal; then, in the fall, the grower can select these plants for propagation. If one waits until fall to do his selecting, he usually knows very little about the fruiting qualities of his plants. There is just as great difference between dewberry plants in a field as there is between the best ears of corn and the poorest nubbins in the cornfield; and no one would think of planting the corn that came from nubbin ears. This is a matter which should receive more attention from growers in the future.

Sometimes plants are selected for propagating purposes which are badly infested with anthracnose. This simply means that the disease is carried from parent to the young plant. By all means avoid such plants in propagation work.

Some of the growers do not even cover up the plants with a hoe, as should be done. They depend upon the canes being accidentally covered at the last cultivation. This, of course, will give plants, but in many cases poor as well as good plants are secured. It is bad practice.

Root Cuttings.—This method of propagating the dewberry is seldom employed in this State. It consists in making cuttings two to three inches long and one-quarter to one-half inch thick, from the roots of old plants, planting these out in nursery rows about tow to three feet apart, and covering the roots about one to two inches. This method has the advantage of giving a large number of new plants from a few old plants. It has another advantage, in that no disease, such as anthracnose, is carried from parent to the young plant. It has the disadvantage of not making strong-bearing plants as quickly as the tip-layer method. Of course, when this method is employed, the same precautions should be taken that were suggested in the tip-layer method.

The best time for making these root cuttings is during the fall; they are stored in sand or sawdust over winter and are ready for planting in spring. The soil should be kept mellow and moist until the young plants are well established. It is best to grow these in nursery rows the first season instead of planting them out in their permanent places. Cultivation can be more easily practiced and the plants better cared for in every way.

PLANTING.

Varieties.—Only one variety is extensively grown in this State at the present time. This is the Lucretia. It has given far better satisfaction than any other variety so far tried. It is a vigorous, healthy plant, producing a large amount of large, firm fruit. It is quite subject to anthracnose, however, and this is its chief defect. It may be that we shall find an even better variety in the future; at present, however, we recommend the Lucretia only.

Time of Planting.—The dewberry can be planted during the fall, winter or spring. Usually, only fall and spring planting are practiced in this State.

Fall Planting.—In general, fall planting is preferable. At this season of the year there is usually a large amount of moisture in the soil and air. The plants require only a small amount of moisture, as practically no growth is taking place, and they become fully established before the growing season commences the following spring. They make a much more vigorous growth and are better prepared to withstand any drought the following spring or summer. November and December are the best months.

If one has a heavy clay soil that tends to heave badly during the winter months, it may be best to practice spring planting. Such soils are seldom used in this State for dewberry growing.

Spring Planting.—In this State spring planting is most commonly practiced. Why such is the case the writer has never been able to determine. No good reasons have ever been advanced by any planter for planting in the spring. The disadvantages are spring droughts, the plants are not well established when growth commences, and are not able to make as vigorous growth or withstand the hot weather of spring and early summer. We know of instances where at least one-fourth of the plants have died when planted in the spring. If planted in the fall there is little necessity for any of the plants dying. If they are properly handled, not more than one in fifty should die. If spring planting is practiced it should be done just as early as possible—certainly not later than the first of April, and the first half of March is undoubtedly the best time.

Setting the Plants.—The plants should be carefully dug and planted as soon as possible after digging. Do not expose the roots to the air and sun any longer than is absolutely necessary. If the young plants are to remain in the field for some time before they can be planted, the roots should be covered with soil or with old wet blankets. The holes should be made sufficiently large, so that all of the roots can be well spread out, and in filling in the dirt around the roots it should be firmly packed. In many instances the death of the plant, especially where spring planting is practiced, is due to lack of thoroughly packing the dirt around the roots. Under these conditions open spaces often remain around the roots, they cannot secure moisture from the soil, and dry out badly.

Distances.—The distances apart for planting depend entirely on the method of training and cultivation to be practiced in the field. When the canes are trained to stakes the plants are usually set in squares, from 4½ x 4½ to 6 x 6 feet apart each way. The richer the soil and the more intensive the culture, the closer the plants can be set. If the soil is poor and the cultivation not thorough, 4½ x 4½ feet is altogether too close. Plants require a large amount of plant food, and are unable to get it in a poor soil. When planted on poor soil, it may be well not to put the plants closer than 6 feet apart. The writer believes that, in general, where good cultivation is practiced, 5 x 5 to 5½ x 5½ feet are the best distances.

When the canes are trained to wires the rows are placed from 8 to 10 feet apart and the plants from 1½ to 2 feet apart in the rows. The chief objection to this method is that the ground is not utilized to the best advantage; in one direction the plants are too far apart; in another they are too close together. The space in the center between the two rows lies almost idle, as the roots cannot get to the plant food, and there is too great competition for the moisture and plant food in the row.

CULTIVATION THE FIRST SEASON.

The first season the plants are not trained, but simply allowed to grow on the ground. The cultivation, of course, must be more thorough during this season than is necessary after the plants are fully established. The soil must be kept mellow, moist and absolutely free from weeds. Sometimes the weeds begin growing near the crown of the plant, where they cannot be destroyed by the cultivator. In that case hoeing must be resorted to. This should be done

as soon as the weeds appear. The young dewberry field should not be allowed to battle with weeds. The plants are not cut back or cut off during this season, as they are when they begin fruiting the second year.

FERTILIZING THE FIRST SEASON.

An application of 400 to 500 pounds of cotton-seed meal, per acre, should be given in the spring, soon after setting out the plants.

TREATMENT THE SECOND SEASON.

Beginning with the second season, the treatment differs in some respects materially from that given the first season. The first operation the second season is that of training or tying up the plants.

TRAINING.

Two methods are employed in training dewberries—the stake and the wire methods.

Training to Stakes.—By using this method of planting and training, the plants are equally distant apart in both directions, and cultivation in two directions can be practiced. This is an important matter, especially in this State, where labor is now so scarce. Very little hoeing need be done where this method of planting is employed. The disadvantage is that it requires a large number of stakes, which in some sections are rather costly.

Stakes.—In this method, stakes high enough to support the plants are placed at each hill. These should be about 7 feet long, being placed in the ground 2 feet deep, and extending above the ground at least 5 feet. The thickness of the stake varies considerably among different growers. In some instances growers are using a stake that is really larger than is necessary. If the wood is of the proper kind, a stake about 2 inches square is sufficient, although some as large as 3½ to 4 inches square are in use.

The stake should be of the very best kind of wood obtainable for this purpose. They should be strong, rigid and very durable, and should last, if possible, as long as the plantation does. This means that there are only a few kinds of wood which are well adapted to this purpose. The best kind in use at present—and nothing better can be suggested—is the heart wood of long-leaf or yellow pine. This usually contains a large amount of pitch, which makes it very durable. The sap wood of this pine will not answer the purpose; the stakes rot too readily. In some sections in the eastern part of the State white cedar *(Chamæcyparis thyoides)*, more commonly known in this State as juniper, can be had, and is excellent for this purpose. Red cedar, the heart wood of short-leaf pine, and white oak can also be used with good results.

The setting of the stakes is an important matter. Great care should be taken in distributing the stakes throughout the field, being careful not to drop any of them on the vines, as this bruises and breaks the vines and often renders them useless for bearing purposes. In setting the stakes, care should be taken not to injure the crown of the plant. It should be placed at least 2 or 3 inches from the center of the crown and driven into the ground so that it will stand in a perfectly upright position. This will prevent trouble in cultivation, and the plant is not so apt to break the stake off at the surface of the ground when supporting a heavy plant and crop.

[PLATE V.]

Dewberry Plant trained to a single stake.

Tying.—The most important operation in connection with training is that of tying up the plant. Great care should be taken and only trustworthy persons used for this work. The vines are carefully gathered together, coiled around the stake in a spiral form, and tied at two or three different places. In tying it at two places, tie about the middle of the stake and again near the top; in tying at three places, the first cord is placed about 2 feet above the ground, the second 3½ feet, and the third near the top of the stake. In general, it is best to tie at three places, as the plant is supported in much better condition. (See Plate V.) The cord used in tying should be soft, so as not to cut into the cane. Raffia can also be used for this purpose. It is extremely strong and cheap, but tends to cut into the vines more than the soft cord. The cord should not be drawn so tight as to injure the vine. The vines are usually so long that they exceed the height of the stake by two or three feet; these ends must be cut off. By cutting off the ends, many more laterals are formed on the remainder of the vines, and usually the fruiting is much heavier. The cutting-off is done with a pair of hand pruning shears.

Training to Wires.—In this method the rows are from 8 to 10 feet apart. Strong posts are set 40 feet apart in the row, along which either one or two (No. 9) wires are stretched. With this method cultivation can be practiced in one direction only, increasing the amount of hoeing. Its advantages are cheapness in sections where stakes are difficult to obtain, and the rows are far apart, allowing a wagon to pass between them for hauling out old canes, distributing manure and fertilizers. It allows as many, or more, plants to the acre as the stake method.

Two-wire Method.—Two wires are better than one, as they support the plant in much better condition and are more satisfactory in every way. The first wire is placed about 2½ feet from the ground, and the upper wire about 4½ to 5 feet, and the tying to these wires is very similar to that in the stake method. (See Plate VI.)

A modification of this method, and one which has an advantage, is to gather up the vines in a bunch, tie them to the lower wire, then divide the bunch of vines and tie each half, about 12 inches apart, to the upper wire. This does not crowd the vines so badly, and gives far more light and room for development. It has the disadvantage of requiring two tyings to the upper wire for each hill.

One-wire Method.—The one-wire method, which is used somewhat in this State, is in some respects quite unsatisfactory. There are several modifications of this method; one is to have the wire stretched about 2 feet from the ground, throw the vines over this wire, and let them grow at random. The great disadvantage of this is that, if the vines are long, the upper end of the vine lies on the ground, being elevated only at the middle of the vine. A large portion of the fruit actually lies on the ground, where it is badly shaded, remains wet, becomes covered with sand, and in some instances rots badly. The vines are also blown about by the wind, bruising many of them where they cross the wire.

Another modification of this method is to draw the wire about 3 feet from the ground, bring the vines up to this wire, tie them, and then train the vines along this wire in both directions. (See Plate VII.) The chief objection to this method is that, if the plants are planted as closely as they should be, the vines will crowd badly on this wire; in general, it is not be recommended. In fact, no form of the single-wire method is recommended by the writer.

[PLATE VI.]

Dewberry Plant trained to two wires.

CULTIVATION.

The cultivation, as has already been suggested, must be very thorough. The second season it should begin immediately after tying up the plants, and then should be kept up vigorously just as long as the young growth will allow it: in many instances it could be continued much longer than it is by some of our growers. Even if some of the young growth is broken or entirely destroyed, it does not injure the plant, since all of this growth is destroyed later on in the season. The plant requires an enormous quantity of water at the time the fruit is ripening, as it enlarges very much at this time, and the amount of moisture in the soil has a great influence on the size of the berries produced. If the amount of moisture is not sufficient the berries are small, and if the soil is very dry the berries often shrivel up and never ripen; hence the importance of cultivation at this season.

The cultivator should be composed of a large number of small teeth instead of a few large ones. A perfect mulch should be kept on the surface all the time, never allowing it to become hard or crusted. By keeping such a mulch the moisture is retained in the soil.

The number of cultivations will depend somewhat upon the season and conditions. It is almost impossible to state just how often one should cultivate. In general, once a week is not too often. The cultivation should be given just as soon as practicable after every shower of rain. This can be done in all the dewberry sections, since the soil is of a sandy nature and is not injured by cultivation when wet. By practicing this, the soil does not become hard and compact, and it helps to conserve the moisture in the soil. The importance of such thorough cultivation is usually not appreciated by most of our growers. They think all that is necessary is to keep the field free from weeds. The field, of course, should be kept free from weeds, but this is a secondary matter, compared with the importance of retaining moisture.

If cultivation is continued late, it is important to see that as little of the fruit as possible is torn off. Another important matter is to keep the cultivator and singletree from injuring the fruiting vines. Often canes that are broken in this way fail to mature their fruit. The fruiting dewberry vine is quite slender, brittle and easily broken. Every precaution should be used to prevent injury. The singletree should be as short as is possible to use it; no projections of any kind should be on the harness or sides of the cultivator. Usually the greatest amount of injury is done with a long singletree. The cultivator should not be handled by a shiftless, careless laborer. If one expects to go into the dewberry business with the idea of giving it no supervision and leaving the care of the field to the average careless laborer, my advice to that man is to invest his money in some other crop or business. One of the best cultivators is the Planet Junior, although there are a number of others which are very satisfactory.

ANTHRACNOSE AND ITS CONTROL.

At present, anthracnose is the most dreaded disease of the dewberry. The disease is characterized by Lodeman* as follows:

"This fungus attacks the young canes of raspberries, blackberries and dewberries. The affected parts are circular, but later oval in outline; the central

*The Spraying of Plants, page 355.

[PLATE VII.]

Dewberry Plant trained to a single wire.

part is gray in color, and this is surrounded by a distinct purple rim. These areas are sunken, and when several run together they may cause the cracking of the cane, or even its death. The leaves are also attacked to a limited extent, but with no such serious results. When the fruit stems are diseased, the berries are frequently prevented from ripening, and consequently they dry up on the bushes."

Spraying is of little value in treating this disease. It can be held in check only by cultural methods. The old canes become badly infested with the disease, and must be destroyed immediately after picking. They are of no further value to the plant, as they soon die after the fruit is picked. If they are left in the field for some time the fungus spreads rapidly from old to young canes, and the following year the plants are again seriously infested with the disease.

The common practice at present is to cut off and burn the entire plant, both old and new canes, immediately after picking. (See Plate VIII.) This keeps the disease in check, although it does not eliminate it. The disease is always present, but by practicing this method it is checked to such an extent that it seldom becomes serious.

At present the cutting-off is usually done with a pair of hand pruning shears. Another excellent tool is a pair of shears with long handles and long curved blades, made by a local blacksmith; it has the advantage of cutting more vines at a time and requiring little or no stooping. It can readily be made by any good blacksmith. In cutting off the vines, care should be taken to cut as close to the ground as possible; the stubs should not project above the ground. Often in dewberry fields one finds a great many plants shriveling and the vines actually dying because these old stubs had been left during the previous season and the young vines had simply grown from these old dying stubs. Another disadvantage is that the anthracnose is left on these old stubs and is carried over to the young vines the following season.

CULTIVATION AFTER CUTTING OFF THE CANES.

After the canes have been cut off it is necessary to make enough new canes during the remainder of the season for the following year's crop. This means cultivation of the most thorough kind. The cultivation should begin immediately after cutting off, and should be repeated as often as possible, giving at least one cultivation per week. As soon as the new vines are long enough to interfere cultivation should cease.

If there are any weeds near the crowns of the plants, hand-hoeing must be resorted to. It is practically impossible to get a great many of the weeds which are clustered immediately around the old crowns with a cultivator. These should be carefully removed with hoes and hands.

STABLE MANURE.

Few growers realize the great importance of stable manure in dewberry culture. Some, however, who have tried it know that it is of the greatest importance.

Stable manure is usually richer in nitrogen than in potash and phosphoric acid, and hence is not a well-balanced fertilizer for dewberries. Where growth alone is desired, it answers the purpose quite well. Where a large crop of fruit is wanted, the manure cannot be relied on when used by itself.

Fighting Anthracnose. Canes have all been removed and the young shoots are just beginning growth again.

Stable manure has a far greater value than that of adding plant food to the soil. It is composed largely of humus, or vegetable matter, which is in the very best condition possible for the soil. The great value of humus has already been discussed in a previous paragraph. It should be added that stable manure has also the power to set free plant food present in the soil, especially potash.

It is possible to use too much stable manure, which has a tendency to make too much vine at the expense of fruit, but there is little danger of using too much in this State, especially in the dewberry sections. The great danger is in not using enough, because it is rather difficult to obtain. The writer would recommend using as much as could possibly be obtained. Ten large loads per acre per season is a fair amount to use. Twenty loads every other year will about answer the same purpose. The best time to apply stable manure is during the winter months. It is impossible to do this, because the vines at this time of the year are lying prostrate all over the surface of the ground, and if one attempts to haul in or carry in manure many of the vines will be badly broken and injured; hence, the manure must be applied either in early spring, immediately after tying up the plants, or in summer, immediately after cutting off the canes. Spring is probably the best time, since the crop will receive the benefit of the humus and the plant food in the manure, especially the nitrogen, which will become available in the early part of the summer and can be taken up by the plants about the time the canes are cut off. This is when it is most needed by the plants, as this is the season for cane growth.

FERTILIZERS.

The subject of fertilizers is one of the most important connected with dewberry culture. The soil is usually poor, and large quantities of plant food must be supplied. Commercial fertilizers are rather costly; hence the importance of using them economically.

Usually two applications are made during the year—one in early spring, immediately after tying up the plants, and another in summer, immediately after cutting off the canes. These two applications will be discussed separately.

Spring Application.—This application is largely for the purpose of making the fruit. The canes have already been made during the previous season, and cane growth during the early part of the season is of secondary importance. The fertilizer added should be such as will give the largest amount of fruit. It should consist largely of potash and phosphoric acid, the two principal compounds in the making of fruit. More nitrogen than phosphoric acid is required by the fruit, but on our soils we find that in nearly every instance larger applications of phosphoric acid than nitrogen give better results.

The amount to be used depends somewhat upon the distance apart of the plants and the intensity of culture. The more plants per acre and the more intensive the culture, the larger the amount of fertilizer.

The kinds and amounts of fertilizers used for dewberries in this State vary considerably. It is impossible to say what kind and amount would be best for all conditions. In fact, there is no fertilizer that is best for all conditions, as this is so largely influenced by the character of the soil and the treatment it has received in previous years. Each grower must experiment for himself,

to a certain extent, to see just what his soil requires. If the writer knew nothing of the previous treatment of the land, he would recommend about 750 pounds of a formula something like the following:

10 per cent potash,
8 per cent phosphoric acid,
2 per cent nitrogen.

The following table will give about the amount of fertilizing material required to give the above percentages:

400 pounds of acid phosphate (14 per cent),
150 pounds muriate of potash,
200 pounds of cotton-seed meal.

In many instances this formula might possibly not give any better results than some other formulas now used by dewberry growers.

While phosphoric acid and potash are by far the most important ingredients, it is best to use a small amount of nitrogen, as indicated in the formula. The amount of nitrogen here given is equal to only about one-fourth of the amount of phosphoric acid and one-fifth of the amount of potash. The plant must make some growth at this season of the year, and also requires nitrogen for the development of the fruit.

Summer Application of Fertilizers.—This application is made immediately after cutting off the plants. The fertilizer is for the purpose of making canes during the remainder of the season which are to produce the following year's crop. The element which is most important in making cane growth is nitrogen; hence, the fertilizer should consist largely of this element. Some potash and phosphoric acid are necessary, since the fruit buds which produce the next year's crop are formed, in a large measure, during the fall. Cotton-seed meal is most commonly used and is an excellent fertilizer for this purpose. It consists largely of nitrogen, and also contains some potash and phosphoric acid. At present the writer cannot recommend anything better than an application of 600 to 700 pounds of cotton-seed meal, or 500 pounds of cotton-seed meal and 100 pounds of nitrate of soda, the latter being for the purpose of starting growth quickly.

TREATMENT THE THIRD SEASON.

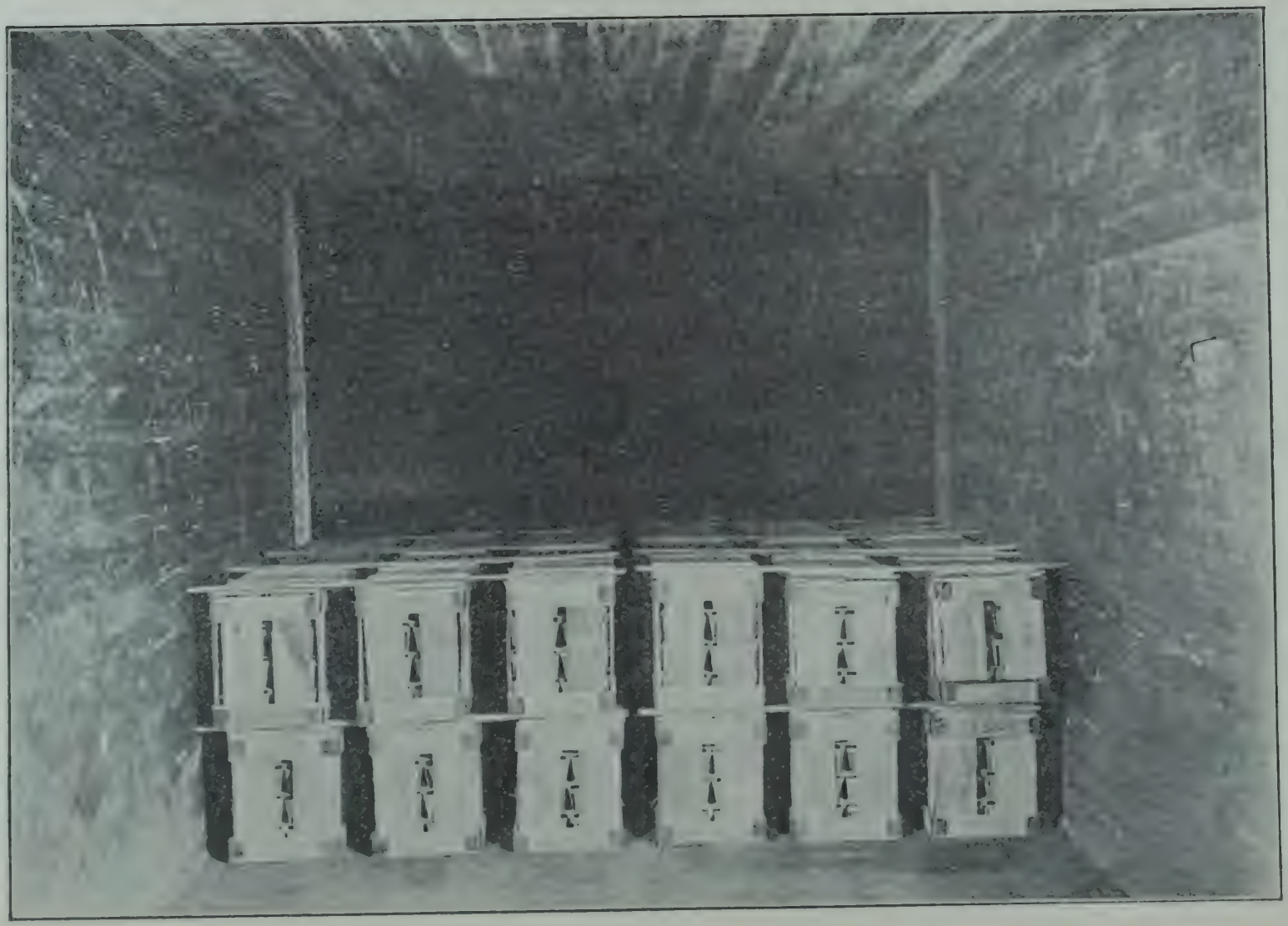
Beginning with the third season, the treatment each season is exactly like that recommended for the second season.

HARVESTING AND MARKETING.

Picking.—It is hardly necessary to emphasize the importance of great care in picking the fruit. It should not be picked until it is fairly well colored, still it must be picked before the berry becomes thoroughly ripe, since it must be firm for shipping purposes. It should be picked as soon as it is well colored.

The fruit should not be picked while it is wet. More fruit is probably lost in transportation because of this one difficulty than from any other cause. While the fruit is wet it rots rapidly and cannot be shipped any great distance. Never pick immediately after a rain or a heavy dew.

The pickers should have close supervision, so that the fruit is not mashed in picking. No berry will carry to market when badly bruised, and no treat-



View in end of refrigerator car. Crates only two layers deep. Notice open spaces between the crates for free circulation of cold air.

ment after picking will remedy the bad effects resulting from poor picking. As soon as the fruit is picked it should be rushed to the packing-house. Often quarts remain in the field for hours after being picked; this is a bad practice, to say the least. The fruit should be put in the shade as soon as possible after picking, and kept cool. To leave it in the hot, broiling sun will ruin it in a short time.

Packing.—Usually the fruit is picked directly into the receptacle in which it goes to market. The only packing that is practiced in the shed is a slight rearrangement of the top layer of fruit in the quart. This is to make the quart appear attractive, to have it full, and still not too full. In getting the quarts too full there is great danger of the fruit on top being badly mashed. All unnecessary handling should be avoided; hence the importance of careful picking in the field. Often many stems are left on the fruit in the quarts. This has a tendency to carry the fruit to market in better condition, but this advantage is largely overcome by the bad appearance of the fruit on the market.

In this State the 32-quart crate is used for shipping dewberries. The illustration on page 128 shows how the crate should appear when ready to be closed up.

Shipping.—The earliest fruit must of necessity be shipped by express. This increases the cost of marketing considerably, but one can afford to pay this, since the fruit brings a higher price at this season. The express from most sections in this State is about as follows: $1.25 per crate to Boston, and $1 per crate to New York.

Very often express is very roughly handled, but it seems almost impossible to prevent this; still the grower should insist, wherever possible, that the crates should be handled with the utmost care.

Refrigeration.—The bulk of the crop is shipped in refrigerator cars. Since the dewberry follows the strawberry season in this State, there is usually no difficulty experienced in getting refrigerator cars. At present railroads will not handle refrigerator cars unless they contain at least 100 crates, and the freight per crate is higher than for cars containing 200 crates. Usually 200 crates are put in a car, being placed two layers deep, six layers wide and sixteen layers lengthwise in the car. This in an average car gives 192 crates. Usually eight more crates are added per car, these being placed on top of the second layer, near the ends of the car. The crates should be packed as illustrated in Plate IX. Notice the space between the cates in the car; this is to allow good circulation of the cold air. Small slats are also nailed across the crates, so as to hold them snugly in place. There should be no shifting or jarring of crates in the car. The cost of shipping (from Cameron, N. C.) in a refrigerator car containing 200 crates is 97 cents per crate to New York and Philadelphia, and about $1.14 to Boston and Western cities.

Selling.—The fruit is usually sold through commission men in the larger markets. The grower should watch the markets from day to day, to see that he does not ship his fruit to markets that are already glutted. Very often growers will ship their fruit to a market which the previous day gave the highest price. This in many cases brings an overflow of fruit into this market. Proper distribution of fruit to various markets is a subject which must be given far more consideration in the future. Very often one market will be flooded while there is a scarcity in another market. If the dewberry growers

would get some one man—as the strawberry growers do in the eastern part of the State—to distribute the fruit properly in the various markets, it would come very near solving the difficulty of too low prices.

CONCLUSION.

In conclusion, the author wishes to state that there are several very important problems in dewberry culture which must be worked out experimentally. Some of these are: the best method of fighting anthracnose, causes and remedy of "double flowering," best method of cutting off canes, best methods of fertilizing, and the subject of varieties. These are now receiving thorough study in an experimental way by the author, and will be discussed in a future bulletin as soon as sufficient data is procured.

CANNING AND PRESERVING.

By Gerald McCarthy,
Biologist North Carolina Department of Agriculture.

THE VALUE AND USES OF CANNED FRUITS AND VEGETABLES.

By a little foresight and the methods described in the following pages any housekeeper may in seasons of abundance and low prices put away against seasons of scarcity and high prices many kinds of wholesome and nourishing foods which would otherwise be largely wasted or sold for less than the cost of producing. In rural communities it is too often the case that during the colder months all the more perishable and wholesome fruits and vegetables are absent from the daily bill of fare. Thus people, and young children especially, are fed upon an improperly balanced ration, which must influence in an undesirable manner both their health and growth.

According to chemical anlaysis, the apple has 18 per cent solid matter and 82 per cent water, while milk has only 13 per cent solid matter, and oysters the same. Cabbage, the great stand-by of the laboring man, has only 8 per cent solid matter and 92 per cent water. Pears have about the same amount of solid matter as apples. Peaches have 20 per cent solid matter and 80 per cent water, while fresh pork has only 24 per cent solid matter. We see, therefore, that fruits are in some respects richer food than milk or oysters, and approximate to that of fresh pork.

Besides contributing sugar and mucilaginous matters as food, fruits by their acid and aromatic principles act powerfully in the capacity of tonics and antiseptics. When freely used at the stage of ripeness fruits prevent debility, strengthen digestion, correct the putrefactive tendency of nitrogenous foods, avert scurvy and increase the power of labor.

The alterative effects of fresh fruit are very great. But every species of fruit does not affect every person alike. Each person must find out by experiment which fruit is the most suitable to effect the desired end in his particular case. There are, however, few cases of diarrhœa which will not yield to pure blackberry juice. The tomato is recommended for torpid liver; the watermelon for derangement of the kidneys; the potato for rheumatism. During the vintage season in the south of France many invalids go there to drink the pure juice of the grape direct from the press. Most of these are sufferers from nervous dyspepsia. The pure fresh juice tones up the system and sets the vital machinery to running aright. Pure unfermented grape-juice preserved in bottles according to the method described in this Bulletin is quite as wholesome as the juice fresh from the press.

CANNING AS AN ART.

There is among the general public a belief that there is something mysterious in the commercial canning process. Canners themselves try to conceal their methods under fanciful or ambiguous names. But the principles of canning are very simple, and are known and practiced by every housewife who puts up a few jars of fruit from her own garden.

The theory of the canning process is based on the principle that fermentation is due to living organisms—bacteria and molds. If we heat food in a vessel closed from the air we kill all the fermentative germs within and no more can get in so long as the package remains air-tight; thus further fermentation is prevented and the food keeps indefinitely. Some germs are difficult to kill in the spore stage. These require to be heated to not less than 240 degrees F. for one time or to 212 degrees F. on three successive days. All the common berry fruits, peaches, apples, and tomatoes are successfully sterilized in cans by heating or "processing" one time at 212 degrees F. The use of temperature above 212 degrees F. requires a strong closed kettle, retort, or an oven.

In practical canning it is found that the open-kettle process, which does not give a temperature above 212 degrees F., is the easiest to manage and turns out the best quality of goods.

Beans, peas, corn, Irish and sweet potatoes cannot be satisfactorily canned by heating in cans to 212 degrees F. for one time, though if heated to that temperature three times on successive days they will keep well. All animal tissues, meats and fish require a temperature of 240 degrees F. to sterilize them.

All of these "high temperature" foods may be satisfactorily canned at home by heating the cans or jars in an oven. To can by this method the bottom of the oven should be covered with a sheet of asbestos board ⅛ inch thick. Asbestos can be bought of most plumbers and hardware dealers. A good chemical thermometer which is capable of showing temperature up to 250 degrees F. is necessary, as in this work guessing at the temperature will not do.

Another way of easily securing a temperature higher than that of boiling water is to use a 25 per cent brine instead of plain water in the process kettle. Two pounds of salt to a gallon of water makes approximately a 25 per cent brine which boils at a temperature of about 224 degrees F. For canning the "high temperature" foods it is best to use the small size or quart cans or jars.

Of late years chemical manufacturers have been urging housekeepers, canners and dealers to use salicylic acid, borax, and many other poisonous chemicals sold under fancy and misleading names for preventing fermentation in canned foods. Their use in canned foods is wholly unnecessary, and in many States such use is illegal. The use of chemical antiseptics in foods is always dangerous to health. Cleanliness, proper attention to sealing the cans and exposure to sufficient heat will preserve canned foods without the addition of any chemicals whatsoever. Not even sugar is essential to preservation of properly canned and sterilized food.

In pickling and drying meats and fish some chemical in addition to common salt is ordinarily considered necessary. The chemical most extensively used for this purpose is saltpeter or nitrate of potash. For mild-cured bacon and hams borax is commonly used in place of saltpeter. Neither of these two chemicals is wholesome or to be recommended. The substitution of pure cream of tartar or of acetate of soda for the above-named chemicals will probably give more wholesome and equally mild and long-keeping meat.

FOOD PRESERVATIVES.

Of all methods for sterilizing foods the best and most wholesome is by means of a temperature at or above the boiling point of water. During the last few

years there have been invented a number of different methods of preserving foods by cooling the air to a temperature near the freezing point. By means of ice or refrigerating machines a temperature of 39 degrees F. can be maintained steadily and easily in properly insulated chambers. Meat preserved in cooled chambers retains its freshness for about eight days. After fifteen days, however, such meat begins to whiten and to contract, expelling the cellular juices and acquiring a bad taste. A few days more suffices to cover the meat with an abundant growth of molds, and to develop in the cells ptomaines or physiological poisons.

The following are the more generally used chemical preservatives:

Acetate of Soda.—Of the different chemicals used for preserving meats, probably the least harmful—salt excepted—is acetate of soda. In practice, however, this preservative has never become popular, because it requires unusually long treatment. Long soaking when the chemical is dissolved in water washes out a good part of the nutritious juice and renders the meat more or less dry and tasteless. When this chemical is used as a powder upon the meat, it also and most energetically abstracts the moisture and juices of the meat. Finally, the chemical is rather expensive for general use.

Sulphite of Soda.—Probably the chemical most extensively used for meat preservatives at the present time is sulphite of soda. This is also largely used on canned vegetables, more especially corn and asparagus, on which it acts as a bleaching as well as a preserving agent. When used upon fresh meat, sulphite of soda gives to the meat a fictitious red color, which color remains even long after the meat has begun to decay. Mince-meat and Hamburg steak as sold on the counters of meat dealers is almost invariably colored and preserved by means of this chemical. Numerous experiments have been made by biologists to determine the effect of sulphite of soda upon the digestive organs. For obvious reasons most of these experiments have been made upon animals. When used in the quantity necessary for masking decay, sulphite of soda causes inflammation of the mucous lining of the stomach and bowels. It also produces diarrhœa, hemorrhage of the stomach, intestines and liver, and fatty degeneration of the kidneys. When used in smaller quantities in experiments upon the human body the results have been a feeling of discomfort, eructations, indigestion and headache.

Nitrate of Potash, Saltpeter.—Saltpeter is a chemical very widely used for preparing pickled or corn beef and pork. The popular impression is that this chemical is a most powerful preservative. As a matter of fact its preservative power is very feeble, being due almost entirely to its quality of absorbing and expelling the cellular juices of the meat. It renders the meat hard, tasteless, and innutritious, even more so than acetate of soda. Its real value depends upon its power of preserving the color of stale meat in a way similar to that exercised by sulphite of soda already referred to. The physiological effects of nitrate of potash are similar to those of sulphite of soda.

Formalin.—Commercial formalin—or, as it is more properly called, 40 per cent solution of formaldehyde—has in recent years come into very general use, more especially as a preservative for milk, cream, and other liquids. This substance is a very powerful antiseptic and acts as a dangerous poison to the living organs of the human body. A 15 per cent solution of formaldehyde suffices, after a dipping of three minutes, to preserve fresh meat perfectly for five days.

When the immersion is extended to sixty minutes, it will preserve meat for twenty-five days. But such meat is not fit for human consumption. As this substance is very cheap and easily used, in practice it is probably the one most generally used upon the western-killed meats which show such astonishing resisting power against decay when hung up in the butcher shops of distant States.

Borax and Boric Acid.—Borax and boric acid are two forms of one chemical which possesses antiseptic powers. This chemical is, next to formalin, the one most extensively used in preserving the "commercial beef" of the big western packing-houses. It is also very generally used in curing bacon and hams. The United States Government has recently made some very important experiments with these chemicals upon the human body by adding to food different quantities of one or the other of these substances. The results of these experiments have been summed up and published by the Bureau of Chemistry of the United States Department of Agriculture, as follows:

"The general results of the investigation show in a convincing way that even in doses not exceeding half a gram (7½ grains) a day boric acid and borax equivalent thereto are prejudicial when consumed for a long time. It is undoubtedly true that no patent effects may be produced in persons of good health by the occasional use of preservatives of this kind in small quantities, but the young, the debilitated, and the sick must not be forgotten, and the safe rule to follow is to exclude these preservatives from foods of general consumption."

Benzoic Acid.—Benzoic acid is very widely used for preserving fancy beverages, the so-called "soft drinks," and the syrups used in soda-water fountains; also for preserves, jams, jellies, and catsups. This substance occurs naturally in urine derived from the human and animal bodies. It was formerly obtained from this source by chemical treatment, but at the present time it is chiefly manufactured from products of coal-tar distillation. While this is one of the least harmful of food preservatives, it is one that no person careful of his health should swallow in any quantity except under the advice of a physician and for its special medicinal effects.

Salicylic Acid.—Salicylic acid is also a derivative of coal-tar and is chemically closely related to carbolic acid. It is a most energetic preservative and in practice is very extensively used in preserving canned fruits and vegetables. This substance has been condemned by the French Academy of Medicine as injurious to the kidneys, and its use as a food preservative is interdicted by most civilized governments.

PRESERVING VEGETABLES.

Asparagus.—The best variety of asparagus for canning is the "Colossal," although any cultivated variety may be used. The shoots should be cut to a uniform height, and may be put up either in flat tin boxes or in the ordinary quart fruit jars. If in glass jars, the asparagus should be cut so that the top of shoots come to about the shoulder of the jar. The asparagus shoots must not be washed, but each shoot should be rubbed lightly with sand-paper or a coarse cloth to remove the outer skin or epidermis. The shoots should be selected so as to place only those nearly the same thickness in one jar. To whiten the asparagus shoots, proceed as follows:

Place the trimmed and skinned shoots in a flat-bottomed vessel of sufficient size, which must be deep enough to contain the entire length of shoot, then pour over the asparagus enough boiling water containing 10 per cent of salt to cover the shoots to one-third of their length. Let these remain so for exactly three minutes. Next pour upon the asparagus additional plain boiling water to cover the shoots to two-thirds of their length and let it remain for three minutes longer. Now cover the pan, place on fire, and let the whole boil vigorously for two minutes—making eight minutes in all. The pan must then be removed from the fire and the water carefully poured or drained off and the asparagus immediately plunged into water, which should be as cold as can be had. Let it remain in the cold water for one hour to remove the salt and green coloring matter. After the shoots have become white, remove from the water and drain, then place in the can or jar, being careful to keep the shoots straight. For liquor, fill the jar or can completely with brine made by boiling one ounce of salt in a quart of water. This brine should be cold before being used. The jars or cans are then sealed air-tight and processed at 212 degrees F. for ten minutes for each pound of asparagus. The processing or heating should be repeated for the same length of time on each of the next two succeeding days. If processed ten minutes at 240 degrees F. in oven, only one heating is required.

Agarics or Mushrooms.—Mushrooms for canning should be freshly gathered. The first grade is restricted to the caps alone, second choice consists of the caps and stems. Only large and well-grown types of the species should be selected for canning and only one species should be placed in the same can or jar. Prepare the following liquid: One quart of water, one ounce of salt and two teaspoonfuls of vinegar. Place all in a basin and bring to the boiling point. Into this boiling liquid throw the mushrooms to be canned, a small quantity at a time, and stir them briskly, but without bruising, until they are soaked through; then cover and give ten minutes boiling. Remove from the boiling-kettle on a skimmer or colander and plunge several times in fresh cold water. Then remove and drain. The mushrooms are next placed in the jars. For liquor use the salty, acidulated water in which the mushrooms were boiled. Close the jars air-tight and process at 240 degrees F. twenty-five minutes, or process at 212 degrees F. for thirty minutes, for each pound of mushrooms, and repeat the processing for the same length of time on each of the two succeeding days. Instead of using the liquor in which the mushrooms were boiled, the jar may be filled with hot melted butter or hot salad oil.

Cabbage or Russian Sauerkraut.—This excellent and wholesome article is much used in Russia, Germany, and Alsace. The process is very simple, as follows: Remove and discard the exterior green leaves; quarter the heads; cut out the cores and the bases of the large outer mid-ribs. Then slice with a sharp knife, and cut into fine strips lengthwise. Weigh the cut or minced cabbage and for each pound of cabbage allow half an ounce of salt. The cut cabbage is then placed in layers in kegs, glass jars, or earthenware vessels, and on each layer is dusted salt from the portion weighed out. Complete the packing by adding enough salt to make one pound of salt for each hundred pounds of cabbage. With the portion of the salt placed on the top of last layer, mix for each one hundred pounds of cabbage one or two handfuls of juniper berries. Upon the whole place a loose cover and weigh it down with a heavy stone. When the vessel is opened to remove cabbage for consumption, enough fresh-

salt brine should be added to completely cover the remaining cabbage, and the board and weight should be replaced.

Dutch or Flemish Sauerkraut.—Only red cabbage is used for this kind of kraut. Remove the outer leaves as with the Russian kraut and cut the quarters into narrow ribbons. Prepare a liquid as follows: For each pound of cabbage slice three apples, removing the cores and seeds; a few sliced onions; two ounces of butter and a tablespoonful of wine or vinegar; salt and pepper to taste, and add a few pieces of sugar. Place the whole over a low fire and allow to simmer two hours. The cooked kraut is then placed in jars and processed as directed for asparagus, but one heating at 212 degrees F. suffices. Cauliflower may also be canned by this recipe.

Green Peas.—The best varieties of peas for canning are the early wrinkled sorts, of which the Alpha and Gem are types; but late peas of the "Telephone" type are also much esteemed. For the best results the peas should be carefully sorted according to size. Usually three grades are made. The smallest grade are the best and are called "extra fine"; the next grade are "medium fine," and the largest grade are called "fine" peas. The grading of the peas can be done by hand, but when carried on on a large scale it is better to use suitable screens or seives. The graded peas are washed and blanched before being placed in the cans. For blanching, for each five pounds of peas use five quarts of water, to which may be added a few crystals of sulphate of copper, although this addition is not necessary nor always desirable. Boil the peas briskly for nine minutes for the larger grade, seven minutes for the medium, and five minutes for the smallest peas. Remove from the fire and drain. When cold place in the cans or jars, which should be filled to within one-fourth of an inch of the top. Make a liquor of the following substances: Ten quarts of water, four ounces of salt, four ounces of white sugar, and one-eigth of an ounce of carbonate of soda. Bring this to the boiling point and then permit it to cool before pouring over the peas in the cans or jars. The larger peas, or lowest quality, may be improved in flavor by adding in the cans a few leaves of chopped lettuce and onions. The cans or jars are then closed and processed at 212 degrees F. fifteen minutes for each pound of peas. The processing or boiling must be repeated for the same period on the next two succeeding days. A single single heating in the oven or retort to 240 degrees F. for fifteen minutes will suffice. Instead of using the liquor above described, ande and one-half ounces of fresh-melted butter for each pound of peas may be used.

Irish Potatoes.—Immature Irish potatoes are very palatable when canned. They are prepared as follows: Choose a roundish variety of potato, which should be just so immature that the skin is easily detached by rubbing with the thumb nail. Wash the potatoes thoroughly in cold water, then by means of a coarse cloth rub off the skin. Wash the potatoes again in cold water, to which has been added one-tenth of an ounce of acetate of soda, or same amount of tartaric acid, or cream of tartar per gallon. Heat the acidulated water and into this throw the cleaned and skinned potatoes and boil for two minutes. Remove by means of a wire skimmer—not the fingers—and throw into cold, slightly salty water. When cold place the potatoes in cans or jars and add the following liquor: One quart of cold water, two ounces of fine salt, a crystal of acetate of soda or cream of tartar. Seal the cans or jars and process at 212 degrees F. fifteen minutes for each pound of potatoes. Repeat the processing for the same period on the two succeeding days. A single heating in

oven to 240 degrees F. for fifteen minutes will suffice. In removing the cans or jars from the kettle be careful not to shake or knock them about, as the potatoes are liable to fall to pieces while they are still warm.

Sweet Potatoes.—Best varieties to can: Yellow Nansemond, Jersey Sweet, Southern Queen and Vineless. Wash and boil the potatoes until the skin cracks. Peel and slice or quarter. Pack solidly in quart cans or jars. Use no liquor. Process in oven twenty minutes at 240 degrees F., or three times on successive days at boiling temperature.

Tomatoes.—For canned tomatoes, the best varieties are those of the more solid kind, such as the Beauty, Stone, Champion, Royal, and Trophy. The tomatoes should be freshly gathered, of only medium size, and as smooth and regular as possible. They must be fully ripe, but not overripe, nor with cracked skins. The tomatoes are first scalded with boiling water until the skin cracks, then peeled and, without further treatment, packed solidly in cans or jars. For liquor use water, to which for each quart add two ounces of salt. This brine should be boiled and cooled before adding to the cans or jars. Seal the cans or jars air-tight and give thirty minutes boiling at 212 degrees F. Where fruit of the proper degree of ripeness is used, and great cleanliness is observed in the handling, it is not necessary to process tomatoes more than once nor to use a temperature above 212 degrees F.

TOMATO SAUCES.

For making sauce, tomatoes that are too ripe or too large or irregular for canning whole may be used. Green or imperfectly ripened tomatoes cannot be used for this purpose. Remove the stems and skins and place the tomatoes in a porcelain or tin-lined kettle. For each hundred pounds of tomatoes use two pounds of salt, one pound of chopped onions, four chopped green peppers and a few chopped peach or cherry leaves. No water is added. Allow them to simmer in their own juice, with frequent stirring to prevent burning, until the whole is reduced to a smooth mass. The cooked mass is then run through a colander to remove hard particles, and all that cannot be passed through a colander must be rejected. The smooth paste thus obtained is returned to the fire and permitted to evaporate down to about two-thirds of its original volume. It is then placed in cans or jars and processed at 212 degrees F. five minutes for each pound of sauce.

Albemarle Sauce.—Tomatoes (skins off), one peck; cinnamon, one ounce, pulverized; mace, one ounce, pulverized; allspice, one-half ounce, pulverized; cloves, one-fourth ounce, pulverized; mustard, one ounce, pulverized; salt, one gill; vinegar, two quarts; onions, two ounces; peach leaves, one dozen; sugar (white), one-half pound; red pepper, one ounce, pulverized; black pepper, one ounce, pulverized; celery seed, two ounces; mustard (white, unground), one ounce. Cook the tomatoes; strain them; add the spices and heat to boiling; when quite cool, add six fluid ounces of old Jamaica rum, or in its lack corn whiskey.

TOMATO PICKLES.

Sweet Tomato Pickles.—Slice one peck of green tomatoes and two good-sized onions, sprinkle over them a cupful of salt, and let stand twenty-four hours. Drain and add two tablespoonfuls each of ground allspice and ginger. Put into a preserving kettle with two pounds of sugar, and vinegar enough to cover; simmer until they look transparent. Bottle and seal tight.

Green Tomato Pickles.—One peck of green tomatoes, sliced; one dozen onions, sliced; one ounce of whole cloves; two ounces of mustard seed; one-fourth pound of ground mustard; one and one-half ounces of black pepper. Put a layer of tomatoes, then a layer of onions, then a sprinkling of salt, then another layer of tomatoes, and so on. Let stand over night; the next morning strain off the liquor, put the tomatoes in the preserving kettle with the other ingredients, cover with vinegar and simmer gently fifteen minutes. Put away in stone or glass jars, and seal tight.

TOMATO CATSUP.

Take one peck of ripe tomatoes; put them in a kettle; boil one hour; take them out; press and strain the pulp through a sieve; put it into a kettle; add six large onions, grated; four tablespoonfuls of brown sugar; one tablespoonful of ground mustard; one tablespoonful of salt; one teaspoonful mace, pulverized; one teaspoonful of cloves, pulverized; one teaspoonful of black pepper, pulverized; three pods of green pepper, cut fine. Mix the seasoning with the pulp; let it boil five hours; stir frequently; just before taking it from the fire, stir into it one pint of strong vinegar. When cold, put into bottles and seal.

DRIED TOMATOES.

In Spain tomatoes are more frequently preserved by drying than by canning. The ripe tomatoes are simply cut in halves and on each cut surface is placed a pinch of salt. The tomatoes are exposed to the direct sun on trays made by tacking cheese-cloth on frames. These trays are elevated some feet above the ground. The trays are taken in or covered up each night. It usually requires eight or ten days to dry tomatoes. When dried, they may be packed in vessels of wood or tin until wanted for use. To prevent insects fouling the drying tomatoes, cover with mosquito netting held a few inches above the fruit.

CUCUMBER PICKLES.

The best pickles are made of gherkins. If ordinary garden cucumbers are used, they should be gathered when about the size of the thumb. A keg, barrel, vat or earthenware jar must be provided for brining. The vessel should have a spigot at the bottom, and should be elevated upon a block or a stand. The vessel should be thoroughly cleaned and scalded. The gherkins or cucumbers, as they are brought from the field and as soon as possible after gathering, are, without any washing or preliminary treatment, thrown into the pickling vessel. Prepare a brine containing for each gallon of water one pound of salt. Heat this to the boiling point and allow to cool before pouring over the cucumbers. Allow this brine to stand on the cucumbers for two or three days, or until it begins to turn white on the surface. Then open the spigot at the bottom, or if there is no spigot turn down the pickling vessel and allow the brine to drain away. Then wash the pickles and the inside of the pickling vessel very carefully and thoroughly with clean, pure water which has been boiled and cooled. Recover the pickles with a 10 per cent salt brine, made as before. To this second brine, for each four gallons of water add one-half ounce of acetate of soda. Close the vessel tightly and place away in a cool, dark cellar. The pickles in this brine will keep indefinitely. When wanted for use, they must be soaked for twenty-four hours in running water or in cold

water, changed every two hours. A better and more satisfactory pickle is made by soaking the pickles, after the salt has been removed, in ordinary cider vinegar for seven or eight days. They are then removed from this vinegar and placed in vessels, from which they are to be consumed or otherwise disposed. In this vessel they may be mixed with small white onions, a little thyme and a few cloves of garlic, and then covered wholly with fresh vinegar, heated nearly to the boiling point, but not boiled. To this vinegar may be added 10 per cent of pure white sugar. The pickles are then ready for consumption.

VARIOUS PICKLES.

In the same manner above described for cucumbers or gherkins many other species of garden vegetables may be pickled, especially the following: red cabbage, cauliflower, carrots, white onions, green peppers, green snap beans, green tomatoes, beets, and capers.

CHOW-CHOW.

Four quarts of chopped cabbage; one quart of chopped onions; two ounces of ground mustard; one ounce of ginger; one-half ounce of cloves; one-half ounce of mace; one-half ounce of cinnamon; one ounce of celery seed; three ounces of turmeric powder; three pounds of sugar; four quarts of green tomatoes, chopped fine; four chopped green peppers; three tablespoonfuls of salt. Cover with vinegar; mix thoroughly and process at 212 degrees F. for ten minutes. Bottle and seal.

MIXED VEGETABLES OR JULIENNE.

Select the following vegetables in the weights given: Carrots, ten pounds; turnips, six pounds; cabbage, five pounds; green peas, five pounds; leeks, one pound; snap beans, one pound. Hash these vegetables and mix thoroughly. Blanch the hash mixture according to the method already described for green peas. Cool in cold water and immediately place in the cans or jars. For liquor use hot melted butter. Process at 212 degrees F. for twenty minutes for each pound of vegetables.

DRIED JULIENNE.

Instead of canning the julienne mixture it may be dried in the sun or otherwise evaporated, after removing from the blanching bath.

PRESERVING FRUITS.

Apricots, Cherries, and Plums.—Apricots should be well grown and perfectly sound, but not completely ripe. The fruit may be pitted or not, as desired, but usually apricots are canned whole and unpitted. The fruit is washed for three minutes in pure boiling water, and is then by means of a skimmer or a silver fork removed from the vessel and placed in the jars or cans. The fruit must not be touched with the fingers after having been scalded, nor with a steel fork or knife. The cans having been packed as solidly as possible, the interstices are filled with a sugar syrup of 20 per cent. The jars are then sealed and processed at 212 degrees F. for twelve minutes for each pound of fruit. The jars after being removed from the processing kettle should be cooled as quickly as possible. Usually one processing is sufficient. Plums are canned in the same way as apricots. Red cherries are also canned by the above formula.

but as they will lose some of their color, the syrup is to be colored by means of a little tincture of cochineal, which substance is an animal product and not unwholesome. It can be bought at any drug store.

Peaches.—Peaches for canning should be fully grown, but not perfectly ripe. The fruit may be canned whole or halved. If halved, remove the pits, but crack a few of these and add them to each jar to give flavor. The fruit should be selected so as to get only the one size in same can. The fruit should be peeled. Scald until skin cracks, then peel with silver-plated knife. For a blanching liquid use boiled and cooled water, acidulated with the juice of a lemon. They should be allowed to remain in this liquid for six to eight hours. Then, without additional washing and without touching with the fingers, with a wooden or silver-plated spoon pack in the cans or jars. Cover with a syrup containing 15 per cent to 25 per cent of sugar, close the jars and process at 212 degrees F. ten minutes for each pound of fruit. Remove the vessel from the processing kettle and cool as quickly as possible. No second processing is required for peaches.

Strawberries.—Strawberries for canning are hand-picked to avoid leaves and trash. All stems and hulls must be removed. The berries are then placed in a porcelain vessel and covered with a cold 25 per cent sugar syrup, which is allowed to remain on them for twelve hours. By means of a strainer or any suitable utensil, remove the fruit from syrup and place in the cans or jars without touching the fruit with the fingers. Fill the cans as tightly as possible without mashing the fruit, and then pour upon them enough of the cold syrup in which they have been soaking to completely fill the can. Close the can and process at 212 degrees F. for ten minutes for each pound of fruit. A little tincture of cochineal may be added.

Huckleberries, or Blueberries.—Make a syrup of one quart of water and one pound of sugar. Let it come to the boiling point. Fill the jars solidly and pour hot syrup over them. Process as for strawberries.

Blackberries.—Sweeten a little, but add no water. Fill jars and process as for huckleberries. Use no liquor.

Apples.—For canning select a variety with firm, spicy flesh and not overripe. Apples must be pared and the core removed, and may be quartered or not. Without further treatment, place the fruit in the cans or jars and cover with a 25 per cent sugar syrup. To give additional flavor, a little orange, citron or lemon peel may be added. The cans are then closed and processed at 212 degrees F. ten minutes for each pound of fruit. Pears are treated in the same way as apples, but they are first to be blanched. Green ginger root is preferred for flavoring pears.

Cantaloupes.—Melons for canning should be not completely ripe. The skin or rind and the central pulp must be removed. The melon is then sliced and allowed to macerate for twelve hours in its own juice, covered with a mixture of granulated or powdered sugar and grated nutmeg. They are then, without further treatment, to be placed in the jars and covered with the juice in which they have been macerating. This juice should contain about 25 per cent of sugar. The jars are then closed and processed ten minutes for each pound of fruit. Squash and pumpkin, when prepared by this recipe, are excellent.

Figs.—Figs for canning must be fully ripe and freshly gathered. Let them macerate for twelve hours in a 25 per cent sugar syrup. Then, without touching the fruit with the fingers, with a wooden or silver-plated spoon remove

from macerating dish and place in the jars. Heat the liquid in which they have been macerating to the boiling point and pour over the fruit in the jars. Should there not be enough of this liquid for the purpose, use a boiling-hot 25 per cent sugar syrup. Close the jars and process for ten minutes at 212 degrees F. for each pound of fruit.

Dried Figs.—Figs, particularly the Brown Turkey variety, are easily dried in sunlight or in an evaporator. The fruit must be dead ripe. When about two-thirds dry, work and squeeze the figs between fingers to make them soft. Then flatten them and complete drying. Pack in boxes, with a sheet of brown paper between layers.

Kaki, or Japan Persimmon.—Kakis are canned in the same way as peaches, but are first to be peeled and the seeds removed. A 20 per cent sugar syrup is sufficient.

UNFERMENTED FRUIT JUICES.

Grape Juice.—To make wholesome unfermented grape juice that will keep well requires correct manipulation and careful attention to cleanliness during the process. Grapes for this use should be fully ripe, but not over-ripe. All imperfectly ripened berries and all berries showing disease should be picked out before crushing. After crushing the fruit the entire mass should be heated to from 150 degrees F. to 165 degrees F., but not higher than 165 degrees F. A double-jacketed kettle or one with the vessel containing the grapes set inside a larger vessel containing water should be used for heating. Cook the crushed grapes with frequent and vigorous stirring for two hours. The fruit should then be removed from the fire and strained through a thick cloth into the bottles in which it is to be preserved, or if more convenient it may be run from the strainer into large glass carboys holding not more than five gallons. These must be previously washed out with boiling water, and should be as hot as the juice is when ready to be filled. The vessels, whether large or small, must be filled until the juice begins to run out at the opening, and then corked tightly and the cork covered with wax to make it air-tight. If the juice is run at once into small bottles no further manipulation is required. If it is temporarily stored in large vessels, when wanted for consumption it must be once more heated to near 165 degrees F. and strained through cloth into the bottles. When the storage vessel is opened the entire contents must be removed at once. If allowed to remain twenty-four hours in a partly filled vessel the juice will begin to ferment. This fermentation may be stopped at any time by heating the juice to 165 degrees F., but the character of the liquid as unfermented wine is lost and cannot be recovered. It is of the utmost importance that the juice be heated to 165 degrees F., and no more. If heated much above 165 degrees F. the albumen of the juice will coagulate and greatly decrease its nutritive properties, and the natural taste of the juice will be spoiled. If heated to less than 160 degrees F. the ferment microbe will not be killed, and the juice will soon begin to ferment. To insure the proper temperature in the kettle a tested dairy thermometer, costing about ninety cents, should be allowed to float on the juice. In this matter guesswork will not do. Never, under any circumstances, add sulphite of lime or other preservative to fruit juice. Sugar is unnecessary, and should not be used unless the grapes are unripe. Keep the bottled juice in a cool, dark place.

Cherry Juice.—The wild black cherries of the woods are better flavored and make juice superior to that of the cultivated sorts. The pits must be removed. To twenty pounds of the fruit add five quarts of water. Place the whole in a porcelain-lined kettle over a slow fire and simmer until reduced to a paste. Then drain or squeeze the juice out by means of a thin cloth bag and fill at once into bottles. Use ordinary wine bottles which have been previously washed and boiled. Fill completely with juice, but do not cork. The bottles are then placed in a hot-water basin and boiled for three minutes. The corks to be used for closing the bottles should have been previously boiled for five minutes, and then, fresh from the boiling water, are driven down into the neck of the bottle, so as to be even with the opening. The bottle should be cooled quickly, but not exposed to a draft of air, and two days afterwards the surface of the cork covered with melted wax or paraffin. Store in a cool, dark place.

Quince Juice.—For making quince juice, usually only the skins and cores of this fruit which have been accumulated in making quince jelly are used. To twenty pounds of quince parings, cores, etc., add ten quarts of water. Place the whole into a porcelain-lined kettle and set over a low fire; simmer and stir until reduced to a paste. The juice is then squeezed out, sweetened if desired, and bottled. Process at 212 degrees F., as already described in the case of cherries.

Strawberry Juice.—For strawberry juice select well-ripened fruit, crush with a wooden pestle and for each twenty pounds of fruit add three quarts of water. Let simmer one hour, then strain and squeeze the juice out and fill at once into bottles, which are to be processed at 212 degrees F. for four minutes.

Apple and Pear Juice.—Apple and pear juice may be prepared from skins and cores in the way described for quinces, but it is best to use juice expressed from the whole fruit, and only the more highly-flavored varieties of these fruits.

Fruit Puree.—Instead of squeezing out the juice and discarding the solid part, when the entire fruit is used the pulp may be cooked in a porcelain-lined kettle until soft, then forced through a colander. Sweeten if desired, and can hot. Process ten minutes at 212 degrees F.

Fruit Syrups.—Fruit syrups are made in the same way as fruit juices, but they are evaporated over a low fire to one-half original volume. To the concentrated juice add one-half as much brown sugar as there is juice by measure. The syrup must be strained before putting in bottles. Process ten minutes at 212 degrees F.

Marmalade and Fruit Butter.—The lowest grade of sound fruit may be worked up into marmalade and fruit butter. The apparatus needed for this work is very simple. Apples, quinces, and pears must be sliced or chopped, but need not be peeled or cored. Place the chopped fruit in a porcelain-lined kettle and cover with juice of the same fruit. Plain water will do, but this entails more work in evaporating the water. Boil until the fruit becomes soft enough to be easily run through a colander. Pass through colander to remove seeds, skins, and cores. Add sugar to taste. The amount of sugar required depends upon the variety, natural sweetness, and ripeness of the fruit used. Usually in making apple marmalade, to every 100 pounds of apple paste from the colander 30 pounds of brown sugar is added. Cook again until the marmalade

is reduced to desired consistency. Usually 100 pounds of fruit and 8 gallons of fruit juice, to which is added 40 pounds brown sugar, make 110 pounds finished marmalade.

Fruit butter differs from marmalade only in being spiced and using 20 pounds of sugar or 2 gallons of molasses, with cinnamon to suit, to 100 pounds fruit. Both these products keep well in ordinary covered wooden pails, if kept in a cool, dark place, but it is safer to preserve in fruit jars or tightly-covered wide-mouthed bottles.

FRUIT JELLIES.

The following recipes for making jelly and fruit pastes are mostly from French sources.

The varieties of fruit most suitable for jellies are the apple, pear, peach, strawberry, gooseberry, currant, and quince.

Apple Jelly.—For making apple jelly select only highly-flavored varieties. Crab-apples make better jelly than the standard varieties. The jelly may be either made from fresh juice or from juice which has been canned or bottled as described in the previous chapter. The fresh juice is, however, much the better. For apple jelly take ten pounds or one gallon of juice and ten pounds of sugar. A little orange juice will improve the flavor and a little lemon juice helps to jellify. The sweetened juice thus made is cooked over a low fire until the mass is reduced to two-thirds of the original volume. It is then placed in wide-mouthed jars and permitted to cool before being sealed. It may be kept in tumblers with the top covered with waxed paper. Jellies are not processed.

Pear Jelly.—Make pear jelly in the same way as apple jelly.

Quince Jelly.—Four quarts of quince juice, or use one-half quince juice and one-half apple juice; eight pounds of sugar. Cook this over a low fire—skimming off the scum—until reduced to two-thirds of the original volume. It is then placed in jars or tumblers, which should be filled to the very brim, as quince jelly always contracts on cooling. The jars should not be sealed until two days after placing the jelly in them.

Peach Jelly.—For peach jelly use only full-ripe fruit. The fruit must be peeled and pitted. The fruit is then to be pressed and the juice used as follows: eight quarts of peach juice; three quarts of apple juice; ten pounds of sugar; and juice of two lemons. Let this cook over a low fire until reduced to two-thirds its original volume. Skim off all scum. Place in jars and allow to solidify before sealing.

Strawberry Jelly.—Strawberry jelly is made by the last recipe, but will be much improved in quality by substituting pineapple juice for the apple juice given in the recipe.

Currant and Gooseberry Jelly.—Take six quarts of juice of red currants; two quarts of juice of white currants; two quarts of strawberry juice, and twenty-five pounds of sugar. Cook slowly until reduced to two-thirds of the original volume. When completely cooked, add enough solution of cochineal to give a desirable color and carefully skim off all scum. It is then placed in jars and allowed to solidify before sealing. Straight gooseberry jelly may be made by the same recipe.

Cherry Jelly.—Take five quarts of juice of black or red cherries; five quarts of apple juice; five teaspoonfuls of cherry-laurel water and twenty pounds of

sugar. Cook the mixture until reduced to two-thirds of the original volume, and carefully skim off all scum. Before placing in the jars, if the color is not satisfactory add a little of the tincture of cochineal.

In the making of all kinds of jelly, in order to determine when the fruit is sufficiently cooked, let fall a drop of the cooking mass upon a cold plate. If the drop remains round when cool the jelly is sufficiently cooked. In all cases the jars in which the jelly is placed for preservation should remain uncovered from twenty-four to forty-eight hours. The surface of the jelly should then be covered with either the ordinary Mason can covers or with a round of clean white paper moistened in whiskey or alcohol, and over this should be placed a piece of glazed paper, or, what is better, a circle of the parchment paper used for wrapping butter. Bend down the edges and tie around jar with a string. Store jellies in a cool, dry, dark place.

FRUIT PASTES.

In the making of fruit pastes or confections only fresh fruit can be used. The principal operation in making these confections consists of cooking the fruits in sugar syrup. The cooking must be done exactly right or the quality of the confection will not be good. In preparing the syrup it is first heated to a temperature slightly below the boiling point and kept there until the syrup begins to thicken. The proper point or "first stage" of syrup may be determined by moistening the finger in fresh cold water and plunging it into the syrup. Withdraw the finger and immediately plunge again in cold water. If the syrup has arrived at the proper degree of cooking, a light granular envelope of crystallized sugar will remain around the finger. When the syrup has reached this condition the fruit may be introduced. The temperature should not be increased. From time to time a little of the cooking paste should be removed with a spoon and with the fingers of the other hand draw it out from tip of the spoon into a string. When the paste has become so thick that it will draw out into a long string, it has reached the "second stage" and the cooking of the confection is done. The confection must then be removed from the kettle and at once placed in jars and sealed. Jelly jars or tumblers are used. No after-processing is required.

Confection of Apricots.—Choose thoroughly ripe fruit, scald, peel, and crush; take of the pulp six pounds. Add to this six pounds of sugar. First stir the sugar into the juice obtained from the fruit in the crushing process. Heat to the "first stage" above described. Then add the fruit pulp, mix thoroughly and let simmer about half an hour until reduced to the "second stage" above described. In case not enough juice is obtained in crushing the apricots, apple juice or plain water may be substituted.

Confection of Pears.—Pear paste is made in the same way as apricot paste; but the juice used to boil the sugar to the "first stage" should be obtained from fruit specially pressed for the purpose, and the pulp from which this fruit juice has been extracted should be discarded. The pear juice should be evaporated to about one-third its original volume before the pulp is introduced.

Strawberry Paste.—Take two quarts of apple juice and in this cook nine pounds of sugar. When this syrup has been cooked to the "first stage" introduce into the syrup four and one-half pounds of uncrushed fruit and enough

tincture of cochineal to give the paste a desirable color. Cook and stir until the fruit is reduced to a pulp and will string out as already explained, then at once place in jars or tumblers.

Peach Paste.—Choose thoroughly ripe peaches of a variety having a spicy flavor. Peel, pit, and crush them with a wooden pestle. For two quarts of juice use nine pounds of sugar and cook until it reaches the "first stage" above described. Then add four and one-half pounds of peach pulp and let it cook until the mass will string. Then place in jars.

Mixed Fruit Paste.—For a mixed fruit paste one can use almost any desirable mixture: for instance, peach, pear, apple, cherry, strawberry, fig, etc. Crush these and with the juice of the mixed fruits or of any part of the mixture make a sugar syrup and cook until it reaches the "first stage" above described. Then add the fruit and cook for about one-half hour. At once place the fruit in jars and add sufficient clear sugar syrup cooked to "first stage" to completely fill the jars. The jars must then be sealed air-tight and processed at 212 degrees F. as for canned peaches.

Rhubarb Paste.—For this confection either red or green rhubarb stalks may be used. The stalks are cut into small pieces and placed in a porcelain dish or jar and covered with an equal weight of white sugar. The rhubarb is allowed to macerate and absorb the sugar for one night. Next drain off the juice and place it in a porcelain-lined kettle and cook until reduced to the "first stage" already described. Then introduce the pieces of rhubarb and cook until the syrup is reduced to the "second stage." As the rhubarb will have lost most of its own color during the cooking, if green rhubarb has been used, the color may be restored by means of a little mixed indigo and saffron. If the red variety of rhubarb has been used, color with a little tincture of cochineal. This confection when cooked should be immediately placed in jars and sealed. It will require no further treatment.

CANDIED FRUITS.

Candied fruits are made in much the same way as fruit pastes, but the fruit is not crushed, but cut into halves or quarters. Pits and seeds are rejected. Use a plain sugar syrup—a pound of sugar in a half pint of water. Cook below 212 degrees F. until it reaches the "first stage." Add the fruit, which must be fully ripe and peeled. Let simmer until fruit looks transparent or "second stage" is reached. Then remove fruit and place in a single layer on a pan and place this in a moderately hot oven until syrup has hardened and the fruit looks dry and glassy.

BRANDIED FRUITS.

The principal fruits preserved in brandy or alcohol are apricots, cherries, peaches, plums, pears, and melons. For this method of preservation all fruits must be thoroughly ripe, but not over-ripe or damaged. The fruit should be gathered before sunrise in the morning and permitted to dry in the shade for some hours. There are two extensively used commercial methods of procedure: For making goods of only ordinary quality it suffices to simply take the fruits after they are collected and dried as above mentioned, and pack them in any clean barrel or jar and cover with 50 per cent alcohol, or ordinary

brandy or whiskey, heated to a little below boiling point. The barrels or jars are then closed tightly and the fruits permitted to macerate in the alcohol for four or five months. They are then spiced and are ready for consumption.

The second process, which is more satisfactory for preparing a high-grade product, is as follows: The fruit is first blanched according to the method given below. It is then cooled and permitted to drain. Then cover with a hot mixture of equal parts of 28 per cent sugar syrup and fifty per cent alcohol or ordinary brandy. By this process the fruit will be ready for consumption after about two months maceration in the liquor.

The following are special recipes for preparing the highest grade of brandied fruits:

Apricots and Peaches.—Select smooth, well-shaped, perfectly ripe fruit. Puncture with a copper or silver-plated fork. The pits are not removed. The fruit is blanched by throwing into hot water containing one per cent of cream of tartar and permitted to simmer slowly for ten minutes. Then remove, without touching with the fingers, and throw into ice-cold water, where the fruit is allowed to remain for ten minutes. Drain and pack solidly into jars in which they are to be preserved. Cover with alcohol of 50 per cent, or brandy, and spice with cinnamon or nutmeg if desired. Allow to macerate for fifteen days. At the end of the fifteen days remove the fruits from the alcohol and permit them to drain. While draining, prepare a syrup containing 28 per cent of white sugar. Take equal parts of alcohol, at 50 per cent, or brandy and the sugar syrup especially prepared for the purpose; heat to 200 degrees F. and with it cover the fruit in the bottles or jars. If the Mason jar is used, the cover must be made so tight that the alcohol or brandy will not evaporate. There is no danger of the fruit spoiling so long as the alcohol does not evaporate. If corks are used cover top with wax or paraffin.

Pears.—The best pears for this purpose are the Duchess, Bartlett, Keiffer, and Sekel; but any good dessert pear may be used. Peel and prick with a silver fork or wooden skewer. Quarter the fruit if large, or leave entire. To blanch, throw them into hot water containing one per cent of cream of tartar and permit them to remain ten minutes. Then plunge into pure cold water for ten minutes. Remove from the water and drain slightly, then cover with a 28 per cent sugar syrup and permit them to macerate twenty-four hours. Place the fruit in the jars in which they are to be preserved and cover with a hot (200 degrees F.) liquor made of two-thirds of a 28 per cent sugar syrup and one-third 50 per cent alcohol or whiskey or brandy. Close the jars or bottles and let them macerate in this liquor for two months, when they are ready for consumption.

Cherries.—The best cherry for this purpose is the Montmorency. The stems are removed and the fruit pricked with a silver fork or skewer and at once placed in jars without blanching. For a pound of fruit add one and one-half ounces of white sugar and then cover the fruit with 50 per cent alcohol or brandy. Allow them to macerate for one month, when they are ready for consumption.

Cantaloupes.—Brandied cantaloupes are prepared in exactly the same way as pears. The best sorts are the small, netted "Gem" varieties. The fruits are sliced or halved, and the rinds and the central pulp removed.

Figs.—Select thoroughly ripe figs of medium or large size. These need not be pricked, as there is already a central opening. Arrange the fresh figs in the

jars in which they are to be preserved and cover with 50 per cent alcohol or brandy and permit to macerate for three weeks. After this period remove the alcohol, heat to boiling point and add to it one-third of its volume of a 28 per cent sugar syrup. Spices—cinnamon, cloves, or nutmeg—may be added, if desired. Macerate again for two months, when they are ready for consumption.

WINE AND CORDIALS.

For making sound, wholesome wine the following apparatus and materials are required:

Sound grapes, fully ripe, but not decayed.

Clean vessels of suitable size for crushing, fermenting and storing the juice. These vessels may be of wood, tinned iron, glass or earthenware.

A saccharometer.

A floating or "dairy" thermometer.

A clean, odorless paddle or rod for stirring the juice.

Dippers, pails, hose, faucets, etc.

For home use we recommend making only dry red wine. White wine is very difficult to keep without "fortifying" it with alcohol, and fortified wines are not wholesome.

To make red wine the ripe grapes must be crushed in a vessel having holes near the bottom to allow the juice to run into another vessel placed below. Crushing may be done by means of a wooden pestle or any suitable device. It is usually best to crush the stems of the grape bunches with the berries. These stems contain a large amount of tannin, which substance is necessary for a long-keeping wine and is rather lacking in the berries, especially in grapes of the Scuppernong type. The crushed grapes are at once put into the fermenting vat, which should be small, or not larger than a barrel. A weighted frame or porous cover is put over the crushed grapes to hold them down below the surface after fermentation has begun. The vat is then filled to within not less than 20 inches of the top. Fermentation will set in spontaneously within twelve hours and will become violent within thirty-six hours. It is usually completed within ten days. The temperature of the juice or "must" at the beginning of fermentation and during the entire process is a matter of very great importance. Ignorance of this fact is the main cause of the poor quality of most home-made wine. The temperature at the start should be less than 60 degrees F. If necessary, ice should be used to reduce the temperature of the fresh juice. For each degree of sugar shown by the saccharometer the temperature of the fermenting juice will be raised about 1 degree F. But the yeast plants themselves are paralyzed at a temperature of about 95 degrees F. If we start with a juice at 75 degrees F. and the juice shows 25 degrees on the saccharometer, the maximum temperature attained before completion of fermentation will be 100 degrees F. This will absolutely kill the yeast plants, and we will have a "stuck" vat. If we start with an initial temperature of 60 degrees F. the highest temperature reached will be 85 degrees F., which is well within the limit of safety. If for any cause the temperature of the fermenting vat passes 85 degrees F. the juice must be at once cooled. This may be accomplished most easily by aerating the juice. A vigorous stirring will often suffice. Pouring the juice from one vat into another will do it. Keeping the outside of the fermenting vat wet will also help reduce the temperature.

Finally, ice may be added to the vat, but this introduces an impurity into the juice and is not desirable. In order to keep the temperature down, small fermenting vats are preferable to large ones, as they offer greater surface for evaporation. If a vat gets "stuck" and fermentation ceases before all the sugar in the juice is transformed, it can be revived and finished by pouring the contents of the "stuck" vat into another vat in such a way as to thoroughly aerate the juice. To the new vat must be added one-fourth its capacity of fresh unfermented juice, and if practicable a quart or so of violently fermenting wine from another vat.

In hot climates or seasons the best plan is to gather wine grapes in the late afternoon, expose them in shallow layers to the night air. This will usually cool the grapes to a safe starting point, then rush the crushing and fermenting. Fermenting vats should always be kept in a cool cellar, which must be dry and well ventilated.

The completion of the fermenting process is indicated by the cessation of bubbles of carbonic acid gas to rise. When bubbles become rare, if your vat has not overheated and "stuck," the main fermentation is over and the new wine should at once be drawn off the pomace and lees. Have ready a clean, well-scalded vessel of nearly same size as the fermenting vat. In this should have been burned a little sulphur, or a strip of muslin saturated with fused sulphur. Fill this vessel completely with the new wine and place a grape leaf or loose cover of any kind over bung. Let stand thus in a cool place until no more bubbles of carbonic gas rise to the bunghole. Then drive in the bung as tight as possible, first filling the barrel, if necessary, until the liquid runs out at bung. Let it stand so with least possible disturbance for one month, then rack off into a fresh barrel, clean and sulphured as before. If at this racking the wine is still turbid it must be "fined." To "fine" red wine take the whites of six perfectly fresh eggs for one barrel of wine. Beat to a foam, add a tablespoonful of fine salt. Mix the whole with a quart of wine drawn from the barrel to be "fined." Stir into the barrel and roll it about to thoroughly mix. Let the barrel now stand another month tightly bunged and completely filled. Rack again, and if the wine is sound it should be perfectly clear. After this the wine must be racked twice a year so long as it remains in the wood.

Red wines are usually not fit to drink until two years old. If wanted to keep longer than this the wine should be bottled when two or two and a half years old. In bottle it will keep as long as desired. No preservative is needed if wine is made as above described. If the wine seems to have gone wrong in any way, a good-sized pinch of dry mustard powder will prevent a barrel from spoiling. But this will give more or less objectionable taste to the wine.

Sparkling wine cannot be well made at home, and its manufacture is not recommended. But many country housekeepers like to have on hand a home-made cordial. Cordials are usually made from sweet wine, and sweet wines always contain at least 18 per cent of alcohol. Dry wines may be used for cordials, though in this case the cordial is what is called a "bitter." The following recipe is a good one for making "Vermouth," a celebrated cordial or bitter:

Dry wine, one year or older	10	gallons.
Sweet oranges, thinly sliced	3	oranges.
Wormwood, powdered	1-10	pound.
Calaminth, ditto	1-10	pound.

Nutmeg, powdered	1-20 pound.
Cinnamon, ditto	1-10 pound.
Germander, ditto	1-10 pound.
Lesser Centaury, ditto	1-10 pound.
Elecampane, ditto	1-10 pound.
Gentian root, ditto	1-10 pound.

DIRECTIONS: Steep the herbs and spices in the wine for eight days. Then strain through muslin and bottle.

If a sweet cordial is wanted, add to the above one gallon of grape brandy and sugar to suit.

CIDER-MAKING.

Apple cider is a much more delicate liquor than either beer or wine. It requires a proportionally greater care in the making. For making good cider the fruit must be fully ripe, but not over-ripe. Cider can be made from summer, fall or winter apples, but as a rule only fall apples are used for this purpose. The best cider is made from the cultivated crab-apples. The best varieties of cider crabs are Transcendant, Red Siberian, and Maiden's Blush. The best of the standard varieties of apples for cider-making are Plumb's Cider, Smith's Cider, Buckingham, and Mother. Where the latter-named varieties, or any of them, are used it will improve the quality of cider to add to the apples from one-fourth to one-eighth their amount in crabs. Where crabs are not available quinces may be used, but not more than 10 per cent of the latter.

Most American apples are lacking in tannin. To secure an additional amount of this and other substances necessary for a sound, long-keeping cider, for each two bushels of fruit add a small handful of clean apple leaves before crushing.

In the ordinary method of cider-making by small hand presses not more than 40 per cent of the juice in the fruit is removed from pomace, while only from one-third to one-half the sugar is recovered. Hydraulic presses extract about 75 per cent of the juice. By macerating the pomace and repressing we may secure practically all the juice and sugar as well as a greatly increased amount of the flavoring matter, aromatics and tannin, which are found chiefly in the skins and which can be dissolved out by water only at or near the boiling temperature.

The fruit should be crushed in a machine having wooden or copper-plated steel rollers, as iron reacts with the tannin of the fruit to darken the juice. Press for what juice can be secured. Remove the pomace and stir it thoroughly into clear, clean water which has been recently boiled and cooled to 75 or 80 degrees F. The temperature must not be above the latter figure. Use one gallon of water for each 40 pounds of pomace. Let macerate for twenty-four hours and then repress and add the liquid to the first pressing. Return pomace again to the macerating vat and for each 40 pounds add one gallon of boiling water. Stir vigorously for two or three hours. Press again and add this liquid to the other pressings.

The best temperature for fermenting cider juice is between 68 and 78 degrees F. The nearer to 68 degrees F. the juice can be held the better the cider. On no account should the temperature go above 80 degrees F., as at that heat the yeast cells begin to die and this will produce a "stuck" vat. The casks and all utensils used in cider-making must be sweet, scrupulously clean

and have been sterilized by means of sulphur fumes. "Sulphur matches," made especially for this purpose, can be had of most druggists, but a few pinches of powdered sulphur or "brimstone" placed on a hot shovel and the bunghole of the cask placed over it will serve as well. New casks, and old ones which have contained other liquids, should be placed in running water for several days before being used to store cider.

At 70 degrees F. the fermentation of cider is completed in about twenty-five days. But most people prefer their cider sweet; therefore the fermentation must be stopped before all the sugar is consumed. Usually about sixteen days actual fermentation will suffice. To stop the fermentation the juice must be rapidly cooled to below 60 degrees F.—the lower the better. The cooling paralyzes the yeast, which soon falls to the bottom of the cask. In fall months, when cider is usually made, the night temperature out of doors is below 60 degrees F., and the cider may be cooled by simply leaving it in open air. The clear juice must then be drawn off and "fined." To "fine" or clear cider we may use clay or tannin, preferably the latter. If clay is used three ounces will do for fifty gallons. Mix the clay with a quart of cider and stir slowly into cask. Then stir vigorously or bung cask and roll about for a while to distribute the clay thoroughly. If tannin is used take for fifty gallons of juice one-half ounce tannin. Dissolve in a gill of brandy and stir slowly into cask. Then agitate again the cask as before. Let the fined cask stand for two weeks and then rack off the lees. The cider is now fit to drink. If the cider is to be bottled it must stand for another two weeks and be racked off once more. Use wine bottles or ordinary mineral-water bottles to keep the cider. Do not use wax on corks or tie them down with wire. Keep the stored cider in a dry, dark place having a temperature below 60 degrees F. Properly made cider stored either in glass or wood and kept below 60 degrees F. will keep sweet in full vessels for over a year.

The chief enemy of stored cider is the vinegar ferment —*Bacillus (Mycoderma) aceti.* This germ does not attack the cider until the alcoholic ferment has ceased to work. It will not grow in any case at a temperature below 60 degrees F. Hence the extreme importance of keeping cider below this temperature. Where the critical temperature must be overpassed, probably the best plan to prevent acetic fermentation is to add to the cask every month or two, one-half pound of the best white sugar dissolved in a half gallon of the cider and stirred slowly into the cask with subsequent agitation to distribute. The sugar keeps up a mild alcoholic fermentation, which in turn prevents acetic fermentation.

Where cider is used from the cask, to prevent spoiling in the partly empty cask pour upon the cider a quart of some tasteless vegetable oil, such as olive or peanut oil. The oil will form a thin film on surface of cider and so prevent access of the acetic and putrefactive ferments always present in the air.

Pear cider, or "Perry," is made in exactly the same way as apple cider.

CIDER VINEGAR.

In the production of pure cider vinegar, four factors are concerned. These are:

1. Pure cider.
2. The presence of the acetic acid ferment, *Bacillus (Mycoderma) aceti.*
3. Free ingress of air.

4. Temperature of the air or room not less than 70 degrees F., nor more than 85 degrees F.

As vinegar is ordinarily made, cider is simply allowed to ferment spontaneously in unbunged barrels in a cellar the temperature of which during the fall months when cider is usually made is pretty constant at about 60 degrees F. The acetic acid ferment does not grow actively at any temperature below 70 degrees F. Hence the relatively long period it requires to produce good vinegar in farm cellars.

Although the acetic ferment requires a comparatively high temperature, there are many other ferments which can grow at lower temperatures. These get into the farmer's vinegar barrels and make trouble. The following-described process will enable anyone to make a fine vinegar with the least possible waste of time and material:

Take sound barrels or any suitably-sized vessels of wood, earthenware or glass—never iron, copper, or tin. Clean thoroughly and scald. Fill not more than one-half full with "hard cider" stock, which should have fermented at least one month. To this add one-fourth its volume of old vinegar. This is a very necessary part of the process, since the vinegar restrains the growth of chance ferments which abound in the air, and at the same time it favors the true acetic acid ferment. Next add to the liquid a little "mother of vinegar." If this latter is not at hand, a fairly pure culture may be made by exposing in a shallow uncovered crock or wooden pail a mixture of one-half old vinegar and one-half hard cider. The room where this is exposed should have a temperature of about 80 degrees F. In three or four days the surface should be covered with a gelatinous pellicle or cap. This is the "mother of vinegar." A little of this carefully removed with a wooden spoon or a stick should be laid gently upon the surface of the cider prepared as above described. Do not stir it in. The vinegar ferment grows only at the surface. In three days the cap should have spread entirely over the fermenting cider. Do not break this cap thereafter so long as the fermentation continues. If the temperature is right the fermentation should be completed in from four to six weeks. The vinegar should then be drawn off, strained through thick white flannel, and the storage vessel corked or bunged tightly and kept in a cool place until wanted for consumption. If the vinegar remains turbid after ten days, stir into a barrel one pint of a solution of one-half pound of isinglass in one quart of water. As soon as settled, rack off and store in tight vessels. Usually no fining of vinegar is needed. No pure cider vinegar will keep long in vessels exposed to the air at a temperature above 60 degrees F.

"Vinegar eels" are sometimes troublesome in vinegar barrels. To remove these, heat the vinegar scalding hot, but do not boil. When cool, strain through clean flannel and the "eels" will be removed.

In making cider vinegar the strength of the product, or per cent by weight of the acetic acid in it, will be equal to or a little greater than the per cent by weight of the alcohol in the cider.

EVAPORATED FRUITS AND VEGETABLES.

The fruits most commonly evaporated are apple, peach, prune, blackberry, raspberry, and whortleberry. There is also a demand for evaporated vegetables, such as corn, sweet potato, and pumpkin. Of all evaporated fruits the apple is most popular and most extensively used.

Only good, sound fruit can be used. The apples are pared, cored and sliced or quartered by machines made for that purpose. The sliced or quartered fruit should be dropped for five minutes into a weak brine made by boiling one pound of salt in two gallons of clean, soft water. The brine prevents the fruit from discoloring. From the brine bath remove the fruit and place in shallow layers on a wire-bottomed or cloth tray. Most evaporators subject the fruit at this stage to fumes of burning sulphur to bleach it. But if the brine bath is used no sulphuring is necessary. Sulphur bleaches the fruit, but at the same time greatly decreases its food value and flavor. The brine fruit retains its natural color and fruity flavor. The salt used does not taste on the fruit. There are many styles of evaporators on the market, from the smaller affair to be set on the back of a cookstove to the giant brick stack. All do good work.

The heat is always supplied by a furnace below the evaporating trays. In the best forms of commercial evaporators there is an elevating arrangement worked by a crank so that each fresh tray of fruit goes in at the bottom, and by turning the crank the whole superimposed stack of trays is moved up one notch to make room for the next tray. By the time the first tray reaches the top of the stack the fruit is dry. The machine is thus continuous and usually works night and day throughout the drying season. No evaporator having a capacity of less than twenty-five bushels of green fruit per day of twenty-four hours can be made to pay commercially. The larger the evaporator the less the cost per pound of finished product. A complete outfit, including paring and slicing machines for evaporating 100 bushels of apples daily, can be installed for about $500.

The following figures as to profits on evaporated fruit are approximately correct for North Carolina:

One bushel of fresh apples will produce 6½ pounds of dried fruit, worth about 50 cents, at cost of 10 cents for labor and fuel.

One bushel of peaches will produce 6 pounds of dried fruit, worth about 50 cents, at cost of 15 cents for labor, etc.

One hundred quarts of blackberries will produce 40 pounds dried fruit, worth $4, at cost of 50 cents for labor, etc.

One hundred quarts of black raspberries will produce 30 pounds dried fruit, worth $6, at cost of 40 cents for labor, etc.

One hundred quarts of whortleberries will produce 40 pounds dried fruit, worth $6, at cost of 25 cents for labor, etc.

PICKLED MEATS.

Corned Beef.—Beef for pickling should be as fresh as possible. The pieces should not be too large. Before placing the meat in the pickle, powder and rub it with the following composition: three parts of fine salt, one part of brown sugar, and one-eighth part of powdered acetate of soda. The pieces of meat, thoroughly rubbed with the above powder, are piled up or placed in a box, vat or barrel, and allowed to remain in the dry salt for eight days, but must be turned over every morning. At the end of the eight days remove the meat from the salting vessel and wash in cold water to remove all salt and clots clinging to the outside. Dry the meat for a short time and then place in a 25 per cent salt brine. In this brine it remains another eight days. It is then removed and washed. After removing from the brine and washing, the

meat should be thoroughly air-dried and then hung in the smoke-house and exposed to cold smoke for forty-eight hours. This amount of smoking will give the meat a slight flavor of smoke, but a longer period may injure the flavor by giving an overdose of creosote. The meat may be allowed to hang in the smoke-house, but without smoke, until wanted for consumption. It may also be hung or stored in any dark, dry place well protected from insects.

Beef tongues are pickled and smoked in the same way as beef joints, but they should be allowed to remain in the brine for fifteen days and be turned over every third day. To enable the brine to penetrate better, the tongue should be punctured in several places with a wooden skewer or with a silver-plated or copper—not iron—fork.

Tripe.—The best tripe is made from the paunch or stomach of beef animals. The tripes should be thoroughly washed and scraped and then placed for twenty-four hours in running water. They should then be put into a heavy iron kettle or, better, an earthenware cooking-dish and simmered in one per cent salted water which has been aromatized with a little thyme or mint. In this vessel the tripe should remain for two or three hours. It is then removed and thoroughly dried, being covered with a clean cloth so as to cool slowly. The tripe at this stage of the process may be preserved in many different ways; but where it is to be consumed only after some considerable time, it is usually canned. In canning tripe and other meats, the temperature must be raised to 240 degrees F. At this temperature the cans or jars must be kept for half an hour for each pound of meat. In the Lyonnaise method of canning tripe it is, after the preliminary treatment as above, cut into small squares and placed in a frying-pan with some butter and large slices of onion, salt, pepper, and parsley to taste. In this pan it is cooked until well brown and then while hot packed tightly into cans or jars, and sealed and processed as above stated. In the Flemish method the tripe is cut into narrow strips and placed in a porcelain vessel over a slow fire, and butter, chopped parsley, pepper, salt, and a little thyme are added, with flour sufficient to make a thin paste covering to the pieces of tripe. Add enough water to cover the whole and the juice of one lemon. Boil for one-fourth hour for each two pounds of tripe. Just before removing from the fire add the beaten yellows of three eggs. The tripe thus cooked is then placed in jars or cans and processed as stated.

MEAT PICKLE OR BRINE.

Each nation seems to have its own peculiar style of meat pickle. The following are some of the best formulas:

German Brine.—For each 26½ gallons of water, take salt, 83½ pounds; carbonate of soda, 20 ounces; and 2 ounces each of cumin and juniper berries. Bring this mixture slowly to the boiling point and carefully skim off all froth. Allow to cool before using.

English Brine.—For each 26½ gallons of water take 27½ pounds of salt, 50 pounds of brown sugar and 2¼ pounds of saltpeter. Place the following substances in a muslin bag: two ounces of juniper berries; 2 ounces of mace; 1 ounce of unground cloves; 1 ounce of thyme, and 1 ounce of cherry-laurel leaves. Place the bag of herbs, the salt, sugar, and saltpeter in the cold water and bring slowly to a boil. Allow it to cool before using, and when cool remove the bag containing the aromatics, and squeeze it thoroughly to extract all the juice.

French Brine.—For each 26½ gallons of water take 97 pounds of salt, 27 pounds of brown sugar and 10 pounds of saltpeter. Place these substances in cold water and then add a muslin sack containing the following aromatics: two ounces of coriander; 1 ounce of cumin; 1 ounce of mace; 1 ounce of nutmeg; 1 ounce of clove-flowers; 10 ounces of an equal mixture of cherry-laurel leaves, thyme, sage and sweet marjoram or summer savory. Bring slowly to a boil and boil five minutes.

Spanish Brine.—Five gallons of water, 5 gallons of red wine, 27 pounds of salt, 8 ounces of carbonate of soda, 25 ounces of saltpeter. Place all together in a pot and boil for ten minutes, then add 2½ pounds of ground white pepper and a muslin sack containing the following aromatics: three ounces of sweet basil and sage mixed in equal parts; 2 ounces of thyme and cherry-laurel mixed in equal parts; and if desired, a pinch of lavender and of rosemary. Cover the vessel and allow the aromatics to remain until the brine is cold. It is then ready for use.

Pickled Ham.—Trim the fresh hams to give them any desirable form, then beat them with a wooden mallet in order to free the veins from blood and favor the absorption of salt. Then rub them thoroughly with salt to which has been added a little saltpeter, or, if one prefers a mild cured ham, use pure cream of tartar instead of saltpeter. Pile and cover the salted hams and leave them to absorb the dry salt for two days, then turn them over, rub once more and let stand two days more and again repeat the rubbing with salt. After six days in the dry salt brush off all salt adhering to the outside, then place the hams in one or the other of the above-described pickles, according to taste. The German pickle is probably the best. Cover the pickling vat or barrel and keep it in the dark to prevent growth of molds. According to the size and weight of the hams they should remain from two to four weeks in the brine. They are then removed and washed in warm water, and with a stiff brush rub off all clotted blood and other impurities and make the ham as white as possible. In this condition they are hung in a well-ventilated, cool, dark place for eight days in order to dry out. At the end of this period of hanging the hams are rubbed with a mixture of rye or wheat flour and powdered soja bean or any yellow pea, so as to give them a yellowish color. They are then hung in the smoke-house, where they should be smoked with oak or hickory sawdust or chips, to which may be added as an aromatizer a handful of juniper berries or some aromatic wood according to taste—sassafras is preferred by many. The hams should hang in the smoke just long enough to give them a light-brown color. If allowed to remain until the hams become black, their flavor and edible value is very greatly injured. On removal from the smoke-house the hams should be hung again for a few days in a cool, dry place to dry off all moisture that may have been absorbed from the damp smoke. They may then be placed in canvas or paper sacks or placed in tight, clean boxes and packed with clean oats or bran, or dry oak or hickory sawdust, or dry wood ashes.

Pork shoulders are salted and smoked in the same way as hams. Other cuts of pork may be salted and smoked in the same way, but these cuts should not remain in the pickle longer than ten days.

Bacon.—Bacon is cured differently from ham in so far that saltpeter and sugar are never used. The pieces selected for bacon curing are rubbed with

plain salt, which they are allowed to absorb for six days, being turned and rubbed every second day. They are then placed in a pickle without saltpeter—preferably the German style—for from four to six weeks, being turned once a week. At the end of this period they are removed from the brine and rubbed with a stiff brush to remove all adhering clots and are then dusted with a powder having the following composition: gypsum, 6 ounces; rye or other flour, 17 ounces; fine salt, 10 ounces; powdered cream of tartar, ½ ounce. Hang the pieces of bacon thus prepared in a dry, cool and dark room until they have thoroughly dried out. They are then lightly smoked, and when dried out the pieces are canvased or may be packed away as above described in the case of hams.

SAUSAGE.

For the preparation of sausage, any kind of lean meat may be used, but all blood vessels and decayed parts must be first removed. The mixed meats should then be hashed in one of the many excellent meat-choppers on the market. The following are methods of preparing some celebrated styles of sausage:

Lyons Sausage.—Meats used in this kind of sausage must be of the best quality. Hams, chines, and rib pieces are most esteemed. Before chopping, the pieces are placed to soak for twelve hours in an aromatic mixture as follows: For each pound of meat take ⅔ of an ounce of fine salt, 1-30 of an ounce of white sugar, 1-15 of an ounce of ground white pepper and two cloves of garlic, or in the absence of garlic use a small onion. Chop the whole finely and put into a mixing bowl with 2 ounces of fat bacon, cut into small cubes or dice, for each pound of sausage meat. Mix the whole thoroughly and then proceed to fill into well-cleaned intestines or sausage casing, which should be cleaned and prepared in advance. When the casings are filled, they should be suspended for forty-eight hours in free air in order to permit moisture to evaporate. The sausages are then taken, one at a time, and squeezed strongly at the ends in order to force the sausage into a solid mass, and fill the space left by the evaporated moisture. The empty ends of the sausage cases may then be refilled or the binding cord may be moved up. The sausages are then to be suspended in a dry, well-ventilated place, where they may remain for four months, but will keep well for a year and a half.

Lyons sausage may be made equally well with an equal mixture of beef and pork. The sausage made in this way is ready for consumption after three months.

French Pork Sausage.—For making this sausage any kind of lean pork meat may be used. It should not be chopped too finely. For each 4 pounds of meat add 1-10 of an ounce of cream of tartar, 1-10 of an ounce of white sugar, 1 ounce of salt, 1-10 of an ounce of sweet marjoram, and 1-5 of an ounce of unground black pepper. Mix thoroughly and fill into well-cleaned casings and suspend for fifteen days in a cool, dry room, then compact the meat in casings and remove to a smoke-house and smoke with cold smoke until well blackened. When removing from the smoke-house, rub the outside with a little melted lard or a piece of fat, warm bacon. Roll each sausage separately in an envelope of paper and pack in boxes with dry wood ashes.

Spanish Sausage.—Spanish sausage is made entirely of pork. The meat is to be chopped not too finely and for each 2½ pounds is added ½ ounce of fine

salt; 1-10 ounce of unground pepper; 1-10 ounce of powdered allspice; 1-30 ounce of yellow saffron; and a small pinch each of thyme, sage, and garlic. For each 25 pounds of the completed mixture, add 1 pint of sherry, brandy, or port wine. Mix thoroughly and fill into small sausage casing and hang the sausages in the drying-room for eight days, then smoke forty-eight hours. Wrap in greased paper and pack in wood ashes or dry oak sawdust.

THE PRESERVATION OF FISH.

As many farmers live near the seacoast or sounds where sea-fish is in season very cheap and abundant, a few words on the best methods of preserving this class of food will not be out of place.

All dead fishes tend to putrefy rapidly, and in this condition develop dangerous "ptomaines" or physiological poisons. Therefore fishes for canning, drying, or pickling should be as fresh as possible. Generally speaking, the methods of preserving fish are in all particulars similar to those used for preserving animal flesh. Fish cannot be canned at a temperature below 240 degrees F.

Kippered Herrings and Mullets.—The so-called "kippered" herrings are well liked by most persons. The following formulas have been found satisfactory in practice:

After scaling the herrings, remove the heads and gills, then remove the entrails without splitting the body. The dressed fishes are then plunged into plain cold brine containing 25 per cent of salt. Allow them to remain in this pickle for forty-five minutes. Remove from the brine, drain, and then arrange them, preferably in flat boxes similar to those used for sardines, but any long box or jar may be used. For spicing the fish, add to the cans a little sage, thyme, parsley, tarragon, a few thin slices of onion and one or two pieces of dried citron or lemon peel. Then introduce into the jar as much as it will hold of juice made of one part boiled water and two parts cold vinegar. Close the jar or can and process the can at 240 degrees F. for five minutes for each pound of fish.

Another way of canning herrings, mullets, and other sea-fishes is as follows: After cleaning and trimming the fish as already stated, cut into transverse slices, rejecting the rib-bones, then place in cans or jars as stated before, and add the same amount of aromatics, but instead of using the liquor beforementioned, run in as much as the can will hold of hot melted butter. Then close and process the cans at 240 degrees F. ten minutes for each pound of fish.

The more common way of preserving herrings is, however, by simply salting them. We can recommend the following plan: Clean and scale the fishes and, without splitting, remove the heads, intestines, and gills. Pack the fishes closely (in layers) in barrels or kegs. Upon each layer of fishes dust a little ground black pepper, and lay on a few slices of onion and aromatic herbs according to taste. After the barrel or keg has been completely filled, head it up under pressure. Then through the bung run in as much as the vessel will take of the following liquor: One gallon of water; 1 gallon of pure cider vinegar; 2 pounds of salt, and 1-10 ounce of pure acetate of soda. Heat this brine to the boiling point and permit it to cool before using. After ten days in the brine the herrings are fit for consumption.

Smoked Herrings or "Bloaters."—For smoking, herrings must be absolutely fresh. Scale and split down belly, but do not remove heads. Remove gills and intestines. Make a brine of 20 parts salt to 100 parts water and add to it 1-10 ounce acetate of soda per quart. In this liquor soak the cleaned herrings for thirty minutes. Remove and flatten and hang them in a current of dry air so as to dry as quickly as possible. When well dried hang in smoke-house for twelve to fourteen hours, or until the herrings have acquired a bright, golden color. They may remain in the smoke-house—without smoke—or in any dry, dark room, until wanted, or they may be packed in boxes in dry wood ashes.

APPENDIX.

In many localities small farm canneries to work on fruit and vegetables will pay well. Commercial canning methods do not differ essentially from those described in this Bulletin, but tin cans are always used instead of glass jars.

The following estimates on canning machinery and outfits for a small commercial cannery are furnished us by a manufacturer of such goods:

TOMATO AND FRUIT CANNING PLANT. CAPACITY 3,000 3-LB. CANS, OR 5,000 2-LB. CANS PER DAY. KETTLES CAN BE SET IN BRICK-WORK OR ATTACHED TO A STEAM BOILER.

Process Kettle, 36 in. dia. x 35 in. deep	$ 18.00
Exhaust Kettle, 36 in. dia. x 24 in. deep	16.00
Scalding Kettle, 30 in. dia. x 24 in. deep	14.00
3 Sets Grate Bars, 3 Furnace Doors, } or 3 Steam Coils if Boiler is used }	15.00
2 Gasoline Fire-pots, complete	32.00
2 6-Tier Process Crates	14.00
2 1-Tier Exhaust Crates	7.00
1 Set of Crane Fixtures	10.00
4 Capping Machines	3.00
4 Capping Coppers	4.00
2 Tipping Coppers	1.00
2 Scalding Baskets	2.00
1 Forging Handle	.25
1 Forging Stake	2.50
1 Vise	2.50
¼ Doz. Files	1.35
2 Pr. Can Tongs	.70
1 Forging Hammer	1.00
1 Floor Truck	12.00
2 Doz. Peeling Knives	2.00
	$158.30

Estimate does not include steam boiler.

A 20-horse-power boiler would be required for the purpose. A building 20 x 45 feet would be a very suitable one for this plant. Boiler may be placed in this building or in a boiler-room adjoining.

MISCELLANEOUS SUPPLIES FOR COMMERCIAL CANNERS.

Acid per carboy ($1.50 allowed for empties), 100 lbs	$ 4.50
Air Gauges	3.00
Air Pump, Hand	7.00
Air Pump, Lever	12.00
Air Pump, Wheel	35.00
Paste, per half barrel	2.00
Sal Ammoniac, per lb	.20
Spelter, per lb	.07
Syrup Gauges	1.00

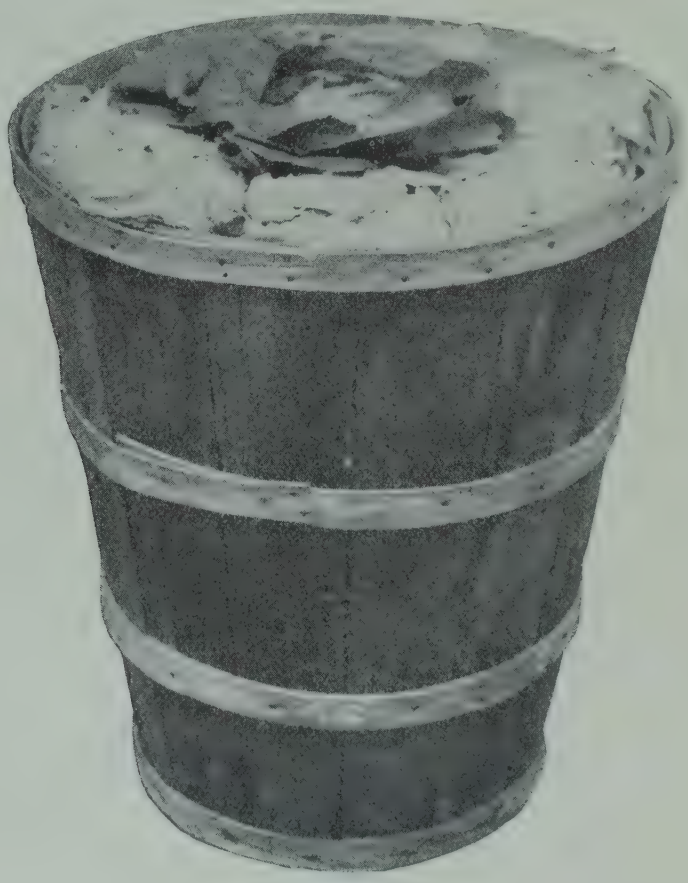
Very few canners now make their own cans. Can-making is a specialty carried on in large factories with aid of improved, patented machinery. As a rule, a cannery whose output does not exceed 5,000 cans daily can buy the cans cheaper than it can make them. Ready-made cans are sold at about $16 per 1,000 for 2-pound cans; $21.50 per 1,000 for 3-pound cans. By the car-load the cans cost a little less. They usually come in crates holding two dozen cans. The same crates are used to ship the packed goods in.

Solder costs 17 cents per pound; soldering fluid 32 cents per gallon. Labels are always lithographed in colors, showing the kind of fruit contained and the name and address of canner. Labels cost from $1.25 to $2 per 1,000.

LETTUCE-GROWING IN NORTH CAROLINA.

W. N. Hutt, State Horticulturist.

Lettuce-growing in eastern North Carolina during the fall, winter and early spring months, for shipment to northern markets, has become an industry of very considerable importance. The mild climate of the coastal plain of North Carolina, moderated by its proximity to the ocean, the warm winter sunshine of this southern region, together with a loose, warm, loamy soil, give apparently ideal conditions for the growth of the lettuce plant. A decade or two ago it was not believed that a soft, succulent plant like lettuce could be grown to perfection in this State during the winter months, but experience has amply shown that the finest quality of lettuce can be grown during the winter and, in many places, without any protection whatever.



The lettuce grown in covered frames in winter in North Carolina is the finest of its kind. It goes to market in competition with that produced in Florida and in the greenhouses of northern cities. Market records show that North Carolina lettuce brings at all points the highest prices. The northern cities, especially in spring, are always looking for fresh early lettuce. The North Carolina spring lettuce goes to market when the northerner is beginning

to tire of his long winter and is sighing for something green. When the North Carolina crop goes forward it takes precedence over lettuce grown farther south. It, in its turn, gives place two weeks later, when the Norfolk product goes forward. Fifteen miles in latitude counts for a day's difference in earliness, or a hundred miles south means about one week in earliness for northern markets.

LETTUCE CENTERS.

The area devoted to lettuce culture in North Carolina is not large, as the crop is grown by intensive methods of culture which lend themselves to restricted rather than to extensive operations. Wilmington, New Bern and Fayetteville are at present the centers of the industry. Each of these centers represents a special phase of the industry. Wilmington, being far south and having a very mild climate, is the center of a region where much lettuce is grown in covered frames and without heat, while still more is grown in open fields with no protection whatever. New Bern is noted for large lettuce outfits, where lettuce is forced by steam heating and irrigation. The Fayetteville lettuce industry is unique, being largely confined to small lots and parcels of land in and immediately surrounding the town. From these three centers the industry is extending to many other localities. The great demand for North Carolina lettuce will undoubtedly increase the present industry and cause lettuce-growing to be taken up more generally throughout the whole trucking region of eastern North Carolina.

CLIMATIC CONDITIONS DURING THE SEASON.

From the sowing of the seed for the first or fall crop until the removal of the last of the spring crop is a period of about eight and a half months, or from the middle of August to the first of May. During this period the weather conditions in the eastern counties of the State are quite mild. The temperature rarely drops below 15° F., while the rainfall, though somewhat irregular, averages 3.7 inches per month. The rainfall at New Bern during these months is considerably in excess of that at Wilmington, while the rainfall at Fayetteville is also slightly less than that at New Bern.

In the matter of temperature we are not concerned particularly with averages, but with the lowest temperature registered during the time the crop is growing. A careful compilation from the weather reports, made by Assistant Horticulturist F. C. Reimer, shows the following conditions during the past five years:

1901-2.

Month.	Wilmington.			New Bern.			Fayetteville.		
	Rainfall.	Lowest Temperature.	Times Below 28°.	Rainfall.	Lowest Temperature.	Times Below 28°.	Rainfall.	Lowest Temperature.	Times Below 28°.
	Inches.			*Inches.*			*Inches.*		
September	5.38	55		7.04	54		5.47	50	
October	2.69	43		1.74	36		1.21	34	
November	1.16	26	1	2.07	25	1	.73	18	9
December	4.72	16	8	5.18	15	7	5.34	10	13
January	1.39	21	6	2.09	18	10	2.20	15	11
February	3.29	23	6	2.00	2		6.18	16	11
March	3.61	24	1	3.20	22	2	2.44	21	2
April	1.62	37		2.49	32		2.75	31	

1902-3.

September	3.57	55		4.88	51		5.25	45	
October	3.18	40		3.99	37		2.00	34	
November	3.83	33		3.77	32		3.28	29	
December	3.26	19	3	4.52	16	6	3.78	16	8
January	3.43	22	2	4.48	20	5	5.08	18	6
February	3.54	23	2	4.82	18	5	5.21	19	5
March	3.32	38		5.20	36		8.79	32	
April	2.05	35		3.97	32		7.99	30	

1903-4.

September	1.16	53		1.04	46		1.98	44	
October	2.46	37		4.54	30		4.98	30	
November	1.03	21	2	1.57	18	5	1.71	16	7
December	2.35	19	5	2.38	22	7	2.58	15	19
January	3.24	15	10	4.24	15	15	2.80	9	18
February	2.19	21	7	5.47	15	15	4.46	17	12
March	4.33	29		4.38	27	1	3.89	27	
April	1.44	39		1.65	30		.53	28	

METHODS OF CULTURE.

According to location and climatic conditions, lettuce growing in North Carolina is carried on under three different methods: (1) Steam-heated and irrigated frames; (2) Covered frames without heating; (3) Open field culture.

Lettuce-growing by heating and irrigation is, as regards the growing, a safe and sure business. It is also the most costly method to install. There is, however, no danger from a sudden drop in temperature, and the crop never need suffer from drought. This method puts on the market the early lettuce that nearly always brings the highest price. The history of steam lettuce-growing in North Carolina has shown that it is a very profitable business.

In warm southern locations, where cold snaps are only occasional, lettuce can be readily grown under protecting cotton covers, with no heat except that of the sun's rays. Lettuce is a cool-growing plant that will, when partially grown, bear even being frozen solid. In its succulent condition at heading time, however, it is very tender and is killed by freezing. This last winter (1906-'07) lettuce under experiment, growing in frames and without heat, was frozen solid three different times and showed no bad effects. Freezing at heading time, however, is always fatal. In this climate, where lettuce is grown under frames, there is very little danger of freezing at heading time. At times of freezing the frames are kept covered and the frost draws out so gradually that no bad effect is apparent. When lettuce is frozen great care should be taken to see that the covers are tightly stretched and do not touch or flap against the frozen plants. Whenever a plant is touched while frozen, it is ruined for market. Open field culture of lettuce is possible only in warm southern locations, where freezing is uncommon. It is, of course, more risky than the foregoing methods, but as the cost is trifling in comparison, one can afford to take some risk. This spring, owing to very favorable market conditions at the last of the lettuce season, field-grown lettuce brought the highest prices paid during the year, and the growers of field lettuce made phenomenal profits. A combination of the foregoing methods would lengthen out the lettuce shipping season and would be well worthy of trial by lettuce-growers. In addition to frame culture, it usually pays the southern grower to increase his acreage by the addition of some of the field-grown crop.

LETTUCE SOILS.

The quality of the lettuce crop is greatly influenced by the kind of soil upon which it is grown, and, while some soils are inferior for the work, their character may be changed to such a degree, by careful management, as to give satisfactory results.

The soils which may be used may be divided into three classes—light soils, heavy soils (*i. e.*, those containing a goodly amount of clay), and medium soils, of a loamy character.

Of the light soils it may be said that they warm up early in spring, give early crops and produce lettuce of delicate texture, but the heads are not so firm as those grown on heavier soil. These soils are benefited by large applications of stable manure, but after the applications the soils should be rolled or packed so as to render them more firm. Better results will thus be secured. Very light soils will not retain their fertility as well as heavy soils. Plant food is leached from them or carried away, beyond the reach of the

plant roots, much more rapidly than in heavier. This difficulty can be lessened by incorporating a great deal of vegetable matter in them, either in the form of stable manure or supplied from a crop of cowpeas or some other legume grown on the soil and plowed under.

Clay lands, if very heavy, are not ideal for lettuce-growing. They do not warm up rapidly enough, the plants grow slowly, while the leaves become strong and fibrous, but the heads are firm, solid and hard. Soils inclined to be very heavy need large amounts of vegetable matter, quite as much as will be found necessary in light soils.

All things considered, the ideal soils for the development of the lettuce crop are those of the nature of sandy loam, resting on a clay subsoil, twelve or fifteen inches below the surface. Soils intermediate in character between the two mentioned above will yield good crops for the early market and at the same time retain their fertility. If properly managed, they will increase in fertility from year to year.

A soil retentive of moisture and plant food has a more or less impervious clay subsoil. No matter how suitable the surface portion, unless there be a firm clay bottom beneath it, the plant food on becoming soluble is quickly leached out and lost if it is not taken up by the crop. Deep, sandy soils, though quick in their action if constantly irrigated and fed, are nevertheless expensive in fertilizers and irrigation. If one is selecting a soil for lettuce-growing or, in fact, for any truck crop, it is well to look carefully into the nature and position of the subsoil.

At the Geneva experiment station soils of different compositions were used in growing lettuce in greenhouses. The following is a summary of the results of their work:

Tests of different soil mixtures for forcing head lettuce have been continued for three winters. A medium clay loam, with various proportions of stable manure and sand, pure sand with manure, and a very light sandy loam with manure, have been tried. The clay loam, with heavy application of stable manure, gave the best results. Light, sandy loam, with heavy application of stable manure, was least satisfactory. On pure sand, with a good dressing of stable manure, the lettuce made a vigorous growth, but the heads were less firm and the texture more delicate than with the lettuce which was grown on the clay loam.—*Bul. No. 146, New York Experiment Station, Geneva, N. Y.*

DRAINAGE.

Soils for lettuce-growing should be well drained. A wet soil is always cold and slow in plant growth. Lettuce, being normally a rapidly growing crop, does not do well on such a soil. When grown slowly, lettuce is bluish in color, fibrous in texture and bitter in flavor. There are some good lettuce soils which, owing to naturally favorable locations, do not require artificial drainage. Most trucking soils, however, are benefited by draining. The simplest method is by open ditches deep enough to lower the water table below the root range of the plants. If ditches do not need to be large, they may be cheaply and conveniently "blinded" by the use of poles, pinetops and straw. Blind ditches, if properly made, will work well for many years. Undoubtedly the most efficient drains are those made of porous tile. Laterals should be 3 inches in diameter, 40 feet to 80 feet apart and 3 feet to 4 feet in depth, according to the nature of the land. To quickly carry off heavy showers, it is usual to have shallow furrows between beds. In the open field the ground is laid off in narrow lands.

HUMUS A NECESSITY IN LETTUCE CULTURE.

In common with all quick-growing crops, lettuce requires a large amount of humus in the soil. Experiments in this line during the past two seasons have proved conclusively that lettuce cannot be grown successfully on land deficient in humus. On two beds of old, worn soil included in the experiment, very few good heads were obtained. The plants grew slowly, showed a bluish color and were tough and bitter. Other beds on the same worn soil, with large additions of manure and vegetable matter, gave most excellent results. Barnyard manure is one of the best and surest means of adding humus to soils, but unfortunately in our trucking regions it is too scarce and high-priced. The cheapest means of adding organic matter to soils is by use of cover crops. Any quick-growing plant that produces a considerable amount of vegetable tissue may be used as a cover or green manuring crop, but of all the plants used for this purpose there are none equal to the legumes or pod-bearers. All legumes, besides adding to the soil the organic matter in their tissues, have the power of bearing upon their roots the nodules in which bacteria store up nitrogen from the atmosphere. The nitrogen procured in this way is clear gain. Peas, beans, vetches, clover and cowpeas may all be used for this purpose. For soil improvement in eastern North Carolina there is nothing equal to the cowpea. Lettuce-growers should see to it that whenever their lettuce soils are not under crop they should be storing humus and nitrogen from a crop of cowpeas.

Humus can also be supplied by means of street sweepings, swamp muck or even peat or turf from wild lands. But in any case it may be set down as a proverb in lettuce culture that *where no humus is there is no lettuce.*

PREPARATION OF LETUCE SOILS.

Lettuce land, which during the summer should be under a heavy crop of cowpeas, should be given a heavy dressing of manure or compost and plowed during the cool weather of early fall. Plowing should be deep, not less than 6 inches, but should not bring up at a single plowing too much raw soil. The early turning down of the cowpeas and manure gives them a chance to decompose, so that they can be thoroughly mixed with the soil. The surface should be kept loose by harrowing, so as to retain moisture. An occasional working with a disc or cut-a-way harrow will help to break up the organic matter and incorporate it with the soil. Before setting out the plants, the soil should be plowed again and thoroughly worked down and leveled. The final touches in cultivation are given with a garden rake. This removes all coarse and undecayed materials and leaves the surface very smooth for marking.

Where well-rotted manure can be obtained, another method we have found even better is to top-dress the land with the manure after frost has killed the cowpea vines. The vines may then be cut up and incorporated with the soil by repeated workings with a disc or cut-a-way harrow. This leaves the vegetable matter nearer the surface of the soil, where it is most needed. After the soil is raked and compacted it is ready for setting.

THE SEED-BED.

For the first or early crop of lettuce, which is to go to market from December 1st to Christmas, the seed is sown from August 15th to September 1st and

the plants set out from September 15th to October 10th. For the winter crop, which goes to market in March and April, the seed is sown from October 1st to 15th and the plants set from November 15th to December 15th. Since the weather is always mild at seed-planting time, we have found it best to sow the seed in the open. This gives firmer, hardier plants for transplanting than those grown under covers or sash. The seed-bed is prepared in much the same manner as the soil in the lettuce frames or in the field, except that it requires less manure. The land for the bed is somewhat elevated or crowned up, so that all surface water drains off. Its surface should be thoroughly pulverized, firmed and raked off. The seed is best sown broadcast and raked lightly into the soil. It takes about two to three pounds of seed to produce the plants for setting an acre. Until the plants come up, it is a good plan to cover the bed with canvas or sash to retain moisture. Only the best seed should be sown, no matter what its cost. It pays to test the seed. If the weather be very dry, the beds may need an occasional sprinkling.

SETTING THE PLANTS.

Plants are ready to transplant from the seed-bed at from four to six weeks after seed-sowing. At that time the little plants will be about three inches high and will be getting the fourth leaf. Very small plants are difficult to handle in setting. The larger plants are taken from the beds first, and the smaller ones then get more room and come on for later plantings. For large head-lettuce the plants are set about 10 by 10 inches or 10 by 12 inches. Many home-made devices are used for conveniently marking off the beds. In our experimental plantings we use a light marking strip, which in length corresponds with the width of the bed. At each end of this a strip 10 inches long is tacked at right-angles to it. This spaces the new row from the last one set. Notches are cut on the marking strip 10 inches apart. The planters kneel on a board and set a plant in every notch of the marking strip. As the setting proceeds, the board and marker are moved backward. The board firms the soil and is a guard against the plants being set too deeply. After the beds are set they should be shaded with the covers for two or three days.

GENERAL CULTIVATION AND MANAGEMENT.

Since the soil for lettuce is given such thorough preparation and fertilization, and since in heated and irrigated frames growing conditions are almost entirely under control, very little cultivation of lettuce beds is necessary. Cultivation is usually to render plant food available and to retain moisture or kill weeds. The previous preparation, together with necessary irrigation, pretty nearly satisfy these needs. However, till the leaves begin to spread out over the ground, an occasional raking may be given with a narrow home-made rake that can go between the plants without disturbing the leaves. About three or four weeks after the plants are set, when they have gotten hold of the soil and are starting into active growth, the second application of commercial fertilizer should be given. A light raking should be given at that time to incorporate the fertilizer with the soil. After the leaves cover the ground all cultivation should cease. Unless the weather is cold or threatening, the covers should be removed during the day and the beds given all available sunshine.

It is not necessary to cover the beds at night unless the temperature is low and frost imminent. If the covers are kept too close it keeps the air moist and encourages disease.

FERTILIZERS.

As has been said before, humus or organic matter is the basis of successful lettuce culture. Any or all of the available sources of organic matter, such as manure, compost, muck, peat or cover crops, should be used to make lettuce soils rich in humus. The additional ingredients necessary can be most cheaply supplied from the commercial fertilizer sack. Sufficient nitrogen is necessary to encourage a rapid leaf growth. An excess of nitrogen will make a soft, loose head that does not ship well. Phosphoric acid and potash seem to add the firmness to the heads necessary to make them carry well to market. A good formula for lettuce is:

4 per cent nitrogen, 7 per cent phosphoric acid, 8 per cent potash,	1,500 to 2,000 pounds per acre.

This formula might appear to be low in nitrogen. It is found cheapest, however, to apply nitrogen by the use of a leguminous crop growing on the land during the summer. As nitrogen is the fertilizing constituent most readily lost from the soil, it should not be applied in large quantities till the crop is in a sufficiently growing condition to quickly take it up. For this reason, and also that the previous cover crop of cowpeas has added considerable nitrogen, this most expensive fertilizing constituent in the formula is reduced. After the crop is in vigorous growing condition, 100 to 150 pounds of nitrate of soda may be applied as a top dressing and raked in between the plants.

With the proper use of summer leguminous crops, 1,500 to 2,000 pounds of the above mixture will be found sufficient. Half of this should be sown broadcast on the land and harrowed in a week or two before the plants are set. The other half should be raked in between the plants three to four weeks after setting.

Most truckers find it cheapest to buy the raw fertilizing materials that offer best on the market, and to make their own mixtures according to percentage desired, rather than to buy ready-made fertilizers.

HARVESTING.

Lettuce should be cut and packed only when dry. The plants are cut close to the ground and the outer leaves removed. Though all the plants in a bed may be planted the same day, it will be found that there is a great deal of difference in the time of their heading. In cutting it will be found necessary to go over the beds several times. Lettuce should be carefully graded. This is easily done by selecting and cutting at one shipment only those heads that are firm and up to size. A day or two later the same bed will give another crop of just as large solid heads. The baskets used in shipping lettuce are the cone-shaped veneer baskets, half-barrel size. This basket should, when well packed, contain twenty-five heads of first-class lettuce. The usual market run is thirty to forty heads per basket. In filling the baskets the bottom row should be placed leaves up. The other courses should be placed leaves down. Figure 3 shows a well-packed basket ready for heading. The baskets should be tightly packed, as there will be more or less shrinkage from drying during shipment to market.

Manufacturers of paper are now making special liners and caps for truck baskets. These are of heavy paper, cut to fit closely to sides and cover. They cost about $25 per thousand for the half-barrel size. We have not yet had an opportunity of trying liners for lettuce baskets, but believe they would materially assist in putting lettuce in the market in good, fresh condition.

Market records for the last three years show that the fall crop of North Carolina lettuce goes to market from December 15th to January 1st, and brings $1 to $2.50 per half-barrel basket. Spring lettuce goes forward from March 1st to April 20th, and brings $1.50 to $4.50. Good lettuce will yield from 800 to 1,000 baskets per acre.

Lettuce has proven to be the best-paying truck crop in eastern North Carolina. With steam-heated and irrigated beds, a lettuce crop will bring $1,000 to $1,500 per acre. Those best informed say that the heated and irrigated beds have always paid good dividends. Truckers admit that it is the lettuce crop that makes up their losses on other ventures.

ROTATIONS.

Lettuce is a rapid-growing plant, maturing in from seventy to ninety days from the time of setting. Its short season thus fits it well for rotating with other truck crops. Since the outfit for lettuce growing is more or less expensive, it is desirable to use it only for intensive, quick-growing, high-profit crops. Cucumbers, eggplant, cantaloupes, beets, radishes and beans may be grown in the frames in winter and spring and fit in nicely with lettuce. The following few rotations give examples of the many combinations of crops that may be used with lettuce:

Rotation for Frames:

1. Lettuce ..... September to December.
2. Beets ..... January to April.
3. Cucumbers ..... April to July.
4. Cowpeas ..... July to September.

1. Lettuce ..... December to March.
2. Cucumbers ..... March to July.
3. Cowpeas ..... July to October.

1. Lettuce ..... September to December.
2. Radish ..... February to March.
3. Beans ..... March to June.
4. Cowpeas ..... June to September.

1. Lettuce ..... December to March.
2. Eggplant ..... March to June.
3. Cowpeas ..... July to November.

Rotation for Field:

1. Lettuce ..... December to March.
2. Potatoes ..... March to June.
3. Corn ..... June to October.
4. Cowpeas ..... Sowed at "laying-by" of corn.

1. Lettuce ..... December to March.
2. Cantaloupes ..... March to July.
3. Cowpeas ..... July to October.

1. Lettuce ..... December to March.
2. Tomatoes ..... March to July.
3. Cowpeas ..... July to October.

It will be noticed that cowpeas find a place in each of these rotations. The cowpea crop is the cheap method of supplying vegetable matter and nitrogen for successive lettuce crops.

With a proper rotation, including cover crops and care in avoiding disease, it is possible to grow lettuce on the same land year after year.

DISEASES.

Owing to dryness of the air, sunlight and better ventilation, winter lettuce in North Carolina is not affected by the many diseases to which the crop is usually subject where grown under greenhouse culture. There is, however, one disease which, even under these conditions, proves quite destructive. This is commonly known as lettuce "drop," "damp," or "wilt." This disease is caused by the action of a minute parasitic fungous plant that grows and thrives in the tissue of the lettuce plant. The disease spreads by means of small, dark bodies known as *sclerotia*, varying from the size of a flaxseed to that of a wheat grain. These lie in the soil and carry the disease over from crop to crop. The plant becomes infected when small, and the disease grows, hidden in its tissues, till about the time of heading, when the whole plant drops down in a single night. On examination the whole plant—root, stem and leaves—and even the soil, will be found covered with a mass of fine cottony fibers. In a week or ten days after the plant wilts the *sclerotia* or reproductive bodies of the fungus will have formed in the dead plant and soil. These lie in the ground and carry over the trouble for the next crop. Each affected plant should be removed, therefore, before it forms its *sclerotia* and infects the soil. As a protection to succeeding crops, it pays to go over the bed regularly and remove all diseased plants as soon as the wilting is noticeable. It is found that the *sclerotia* spread the disease by throwing their spores onto the under side of the leaves. In future experimental work it is intended to try the effect of mulches in protecting the plants from infection.

VARIETIES OF LETTUCE.

There are more than one hundred distinct varieties of lettuce listed in America; of these, only the heading varieties are at present much in demand. Loose lettuce, though of fine quality, does not ship well and is little grown, except in a local way. For winter lettuce growing the Big Boston variety seems to so well fill all requirements that it is at present the leading commercial lettuce.

FRAMES.

Frames for winter lettuce growing may be of any desired width and length to suit the land to be used, but convenience seems to have fixed their width into two standard sizes, viz., 16 feet for wide or double frames and 9 feet for narrow or single ones. Three feet is found to be a suitable width for passageways between the frames. From this it can be seen that with the narrow frames one-fourth of the area is used in walks, and with the wide ones a little less than one-sixth. For convenience in heating and irrigating lettuce and in removing covers, frames are usually made about one hundred feet long. Wide frames are best adapted to warm locations and are often used with canvas covers, but without heating pipes. The narrow beds are specially adapted to steam heating and forcing. On our truck test farm the

frames are made 17 feet 4¾ inches by 104 feet 3¾ inches, so as to include one twenty-fourth of an acre. This makes them convenient in estimating yields and profits. The ends of the frames are removable and are taken out when the beds are being prepared for setting, so that horse cultivation can be given. The rafters which support the cotton covers are 4 feet apart in wide frames and 6 feet in narrow ones, and are also removable. Undressed inch lumber 12 inches wide is used for construction of the frames. (See Plans 1 and 2.)

COVERS.

The cotton cloth used for covering frames for winter lettuce growing must be sufficiently white and thin to admit light to the plants in bad weather, yet strong and heavy enough to be durable and to stand stretching. What is known as "Heavy Domestic," running 3 yards to the pound, is found to best satisfy these requirements. This cloth is 30 inches wide and costs about 8 cents per yard. Exclusive of walks, it takes approximately 4,300 yards to cover an acre. At 8 cents per yard, the cost of covering an acre would be $344. This is one of the most expensive features of lettuce culture in frames.

Methods of Fastening Covers.—Covers last longer where they are entirely detachable from the frames, but in cold weather it is found that the heat can better be retained if the covers are securely tacked or slatted to the rear of the beds. There are various devices in use for fastening down the edges of the covers. A simple and common method is to sew straps or loops of cloth to the edges of the cover every 4 feet and to hook these over wire nails driven in the outside of the frame. Small brass rings may be substituted for the cloth loops. Still another method is to tie a marble or small pebble into the edge of the cloth with fishermen's heavy seine twine and to loop the cord over a wire nail. These methods have the disadvantage that with the warping of the frames and the shrinking of the covers it is often difficult to make loop and nail meet. The most satisfactory method we have yet tried for fastening covers is the turning of a narrow hem on the edge of the cover and threading through this a ⅜-inch rope. This rope may be quickly fastened down, no matter what the position of the nail, and it holds the cover securely. The rope is also a great protection to the covers when the beds are being exposed daily. Without the rope we have found that in uncovering long beds the covers are apt to be ripped and torn by the men pulling them in too long stretches. Rope ⅜-inch size costs about 12 cents and runs about 24 feet per pound. For narrow frames it would require about 3,600 feet of rope per acre, the cost of which would be $18, and for wide ones $14. With short lengths covers are sometimes handled on rollers. This keeps the cloth in good condition and the weight of the roller holds the cloth taut and secure in windy weather. Rollers, however, are difficult to handle on long beds, and for that reason have never come into general use.

With good care covers should last three or four years. Oiling the covers was found to destroy their elasticity and cause them to crack and break. Whitewashing the covers, as sailors do their canvas, would undoubtedly destroy fungous rots and lengthen the time of usefulness of the cloth. When not in use the covers should be folded up when dried and stored in a dry loft.

USE OF SASH.

Glazed sash may also be used in winter lettuce culture, but they have never come into common use. This is doubtless due to their increased cost over

cotton covers and their being fragile and also cumbersome to handle. It is also more difficult to irrigate glass-covered frames than those on which the cotton covers may be quickly and easily reefed. Sash-covered frames, however, maintain a higher and more even temperature in cool weather than cotton-covered frames and bring the crop more quickly to maturity. They also require constant attention regarding ventilation during bright weather. It may be, considering the earliness gained by the use of sash and their greater durability in comparison with canvas, that glass is, in the long run, the most economical and profitable. This point will be tested in future experiments at the State Truck Test Farm.

Sash for forcing purposes are made in the regulation size—3 by 6 feet—and cost about $3 apiece glazed. The frames would be 11 feet wide and had best run north and south, to get the sun on both slopes of the sash. Single-sash beds are best facing the south.

HEATING.

For winter lettuce growing in the mild climate of eastern North Carolina a heating plant is not an absolute necessity, as there are few days when the temperature falls below freezing; but it pays to have a heating system ready to guard against cold snaps and freezes. The supplementing of the natural daily sun's rays with accessory heat makes winter lettuce growing a very sure thing. The additional heat also helps to keep the lettuce growing in cool weather and brings it in for the higher prices of the early market. The history of lettuce growing in North Carolina has proven that steam lettuce growing has been the surest and most profitable method. The steam capacity required per acre for heating and also for irrigating is about 8 to 10 horse power.

Piping.—The main heating pipes will vary in size from 4 inches down, according to the acreage to be covered. Lateral heating pipes should be 1 inch in diameter. The method of piping lettuce frames is simple. It is usually a straight main, with a 1-inch lateral running off it at right angles into each bed. It is not necessary to have a circulation, but simply a straight push of steam with an exhaust at the end. We find, however, that with an exhaust for each frame it is very expensive of steam, and that it is better to couple the rear ends of the pipes in every five or six frames into a common pipe and make one exhaust for the whole. This is found to be sufficient exhaust to allow for condensation and to keep the system working and the temperature fairly uniform throughout. Just a slight exhaust of steam is found to be all that is necessary to keep the steam moving sufficiently. On first installing our heating system we used ⅜-inch pet cocks for exhausts, but soon found them to be constantly plugging up with scale and other foreign substances. After replacing them with ½-inch globe valves there was no trouble. The globe valves can be readily opened and all scale and condensation water blown out occasionally. Half-inch globe valves were found to answer as well for exhausts as the inch size, so reducers were put in and considerable saving in cost effected on the whole system. In lettuce heating, as in all long stretches of pipe, expansion joints have to be put in at intervals to allow for expansion and contraction.

In wide frames the heating pipe is run down the center of the bed and stapled to the center posts sustaining the ribs for the cover. For heating purposes the narrow beds seem to give best results. The lettuce at the rear

or high portion of the frame matures first, so the pipe is placed 3 feet from the lower edge of the frame. This equalizes the heat throughout the frame, as the heat rises to the cover and passes up to the higher portion at the rear of the bed. In wide frames there does not seem to be as good a circulation or distribution of heat. Wide frames have proven to be best for raising lettuce without heat.

IRRIGATING.

In winter lettuce growing in eastern North Carolina irrigation is not a necessity, but with high-value crops and intensive cultivation it does not pay to wait for nature's showers. To keep such crops growing rapidly for the higher prices of the early market it pays to have facilities for supplementing the natural rainfall. In the arid regions of the West, where lack of rain is constant and continuous during the growing season, necessarily expensive systems must be installed. Under our eastern conditions irrigation is only supplemental and consequently must not be too expensive. In lettuce growing the irrigating system may be combined with the heating system and its cost thereby reduced. The boiler that provides the steam for heating can also furnish steam for pumping.

Where water can be obtained from artesian wells, open-furrow irrigation is the simplest and cheapest method. It is only in exceptional localities that such natural facilities are obtainable. In most localities irrigation water must be applied through pipes. The simplest and cheapest irrigation system is that which uses the heating pipes for supplying the water. At intervals of about 20 feet along the heating pipes, upright pipes 4 feet in length are attached. From the ends of these uprights the water is distributed by rose nozzles. This system, though simple and comparatively inexpensive, has not given as good results as where the water is applied as a spray from separate overhead pipes. This latter is known as the Skinner method, and is now most commonly in use by lettuce growers. Large mains are laid on the ground to conduct the water from the point of supply to the field where it is to be applied. From the ground main connections are put in, elevating the laterals about six feet above the beds. The lateral pipes are run in lines down the alleyways between the beds. One pipe will irrigate two beds. The pipes are supported on 4 by 4-inch scantlings notched at the top to hold the pipes in place. Small brass spray nipples are screwed into the lateral pipes at 4-foot intervals. Mr. Skinner gives the following directions for the location and size of pipes for laterals: "The pipes used are ordinary water pipes (the galvanized is best), which may vary in size from ½ inch to 1½ inches, according to the length of the lines intended to be used. For lines 600 feet long we have found it best to use 1½-inch size for one-third the length of the line, beginning at the feed-pipe end, one-third 1¼-inch pipe, 100 feet 1-inch pipe, 60 feet ¾-inch pipe and 40 feet of ½-inch size. This will give a uniform spray the entire length of the line." The smaller sizes of pipe give as good results in distributing the water and, of course, materially reduce the cost of the system. Where each distributing pipe is connected with the supply pipe is a globe valve, a loose joint and a lever for directing the spray. By means of the valve a bed may be sprayed, or not, at will. By turning the lever slightly the loose joint allows the whole length of pipe with its line of nozzles to be turned so as to direct the spray as desired on either bed. Figs. 6 and 7 show the valve, lever and loose-joint connection.

To operate successfully the Skinner irrigation system, there must be an ample supply of water, with sufficient pump capacity and steam pressure to force it from the nozzles into a fine spray. In time of drought there should be a supply of at least 6,000 gallons per acre per day. To supply the necessary power for irrigating, one should figure on from 8 to 10 horse-power boiler capacity per acre. Irrigation water is best applied at night.

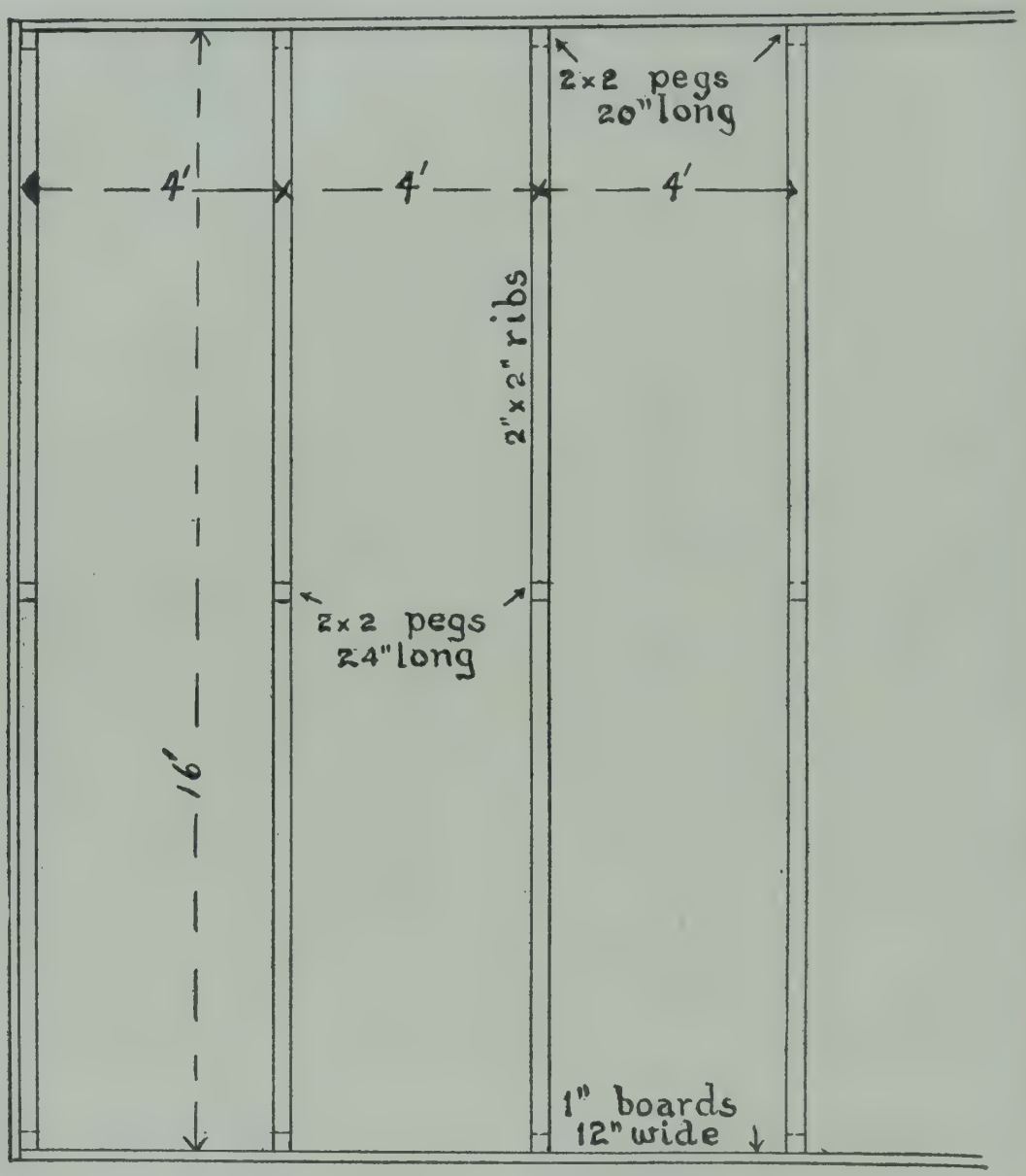
Some growers make use of their irrigation systems for the application of insecticides, fungicides and fertilizers taken into solution.

WATER SUPPLY.

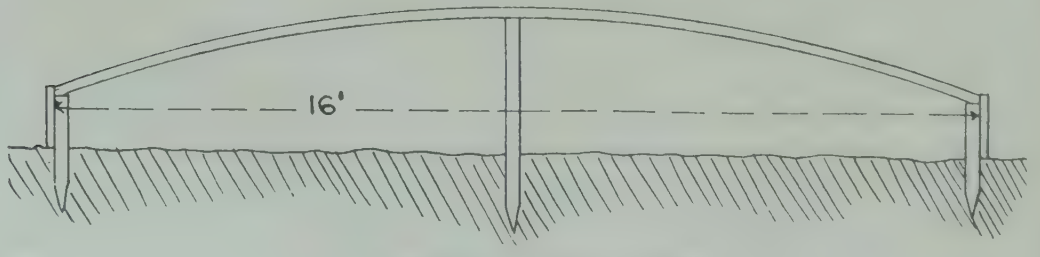
For boiler purposes an abundant supply of clean, soft water is desirable. In some localities this is not always obtainable. Surface water, though usually soft, often fouls a boiler with mud. In most rivers, lakes, creeks, ponds and other sources of soft-water supply this difficulty is easily avoided by proper location and screening of the intake. In deep-water supply the kinds and varying degrees of hardness offer objections for boiler purposes that are much more difficult to remove than those of soft or surface water. For all purposes the soft water of rivers or lakes is usually the most suitable. Where the water of deep wells has to be used, lime or marl conditions, if not too extreme, can be overcome by the use of petroleum or other boiler purges and frequent blowing out. By submitting samples to the State water analyst the value of any water for boiler or other purposes may be ascertained.

CONCLUSION.

North Carolina, with her mild climate, her light, loamy, early soils, and her excellent transportation facilities, has become one of the foremost trucking States in the Union. She is known in the large cities of the North as a wholesale producer of all kinds of vegetables. Market reports show, in addition, that she is a special producer of first-class lettuce. The history of the trucking industry in the State shows that lettuce is, per acre, the most intensive and best-paying truck crop. From the demand for North Carolina lettuce, as evidenced by the price received, it is apparent that the industry is capable of much greater development at very profitable prices. Undoubtedly one of the best horticultural investments in this State is the utilization of cheap lands contiguous to transportation lines for the wholesale production of fall and winter lettuce.



Ground Plan of Wide Frame.



Plan 1. End Elevation of Wide Frame.

MATERIALS REQUIRED FOR WIDE OR DOUBLE FRAMES.

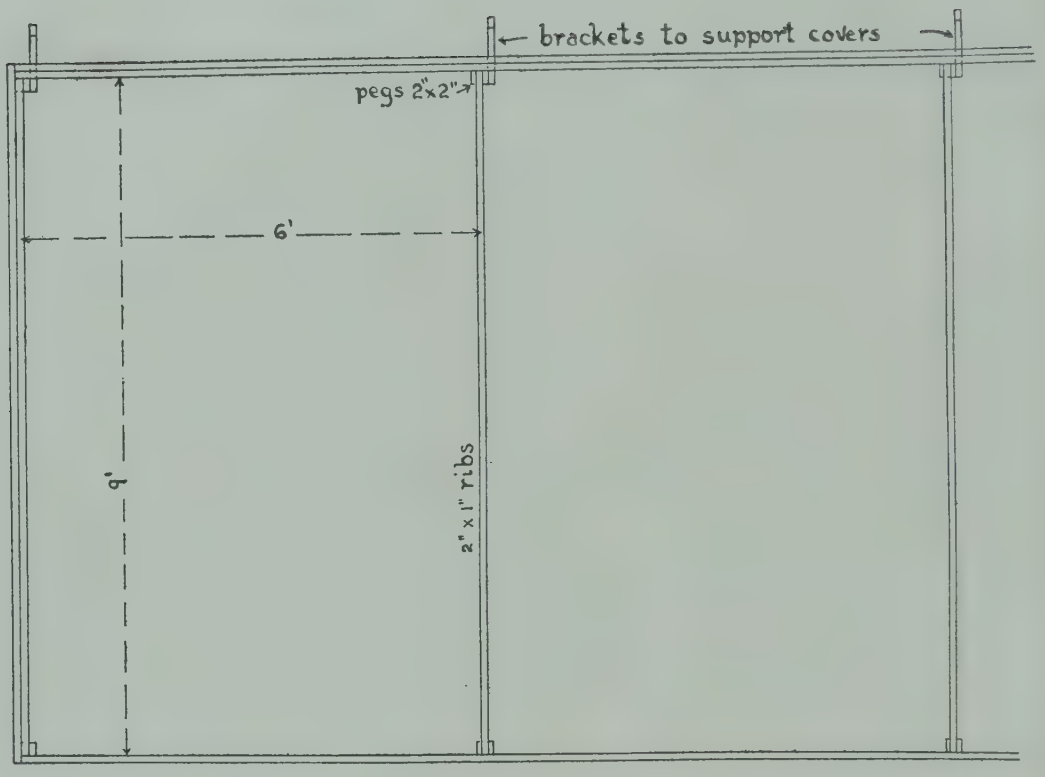
Sides, ends, rafters, posts.
Estimating 23 frames, 100 feet long, per acre.

	Board Feet.
Front and back, 200 (12 inches by 1 inch)	200
Ends, 2 (12 inches by 1 inch by 16 feet)	32
Rafters, 24 (2 inches by 2 inches by 17 feet)	136
Posts, 54 (2 inches by 2 inches by 20 inches)	30
Posts, 24 (2 inches by 2 inches by 24 inches)	16
Total per frame	414

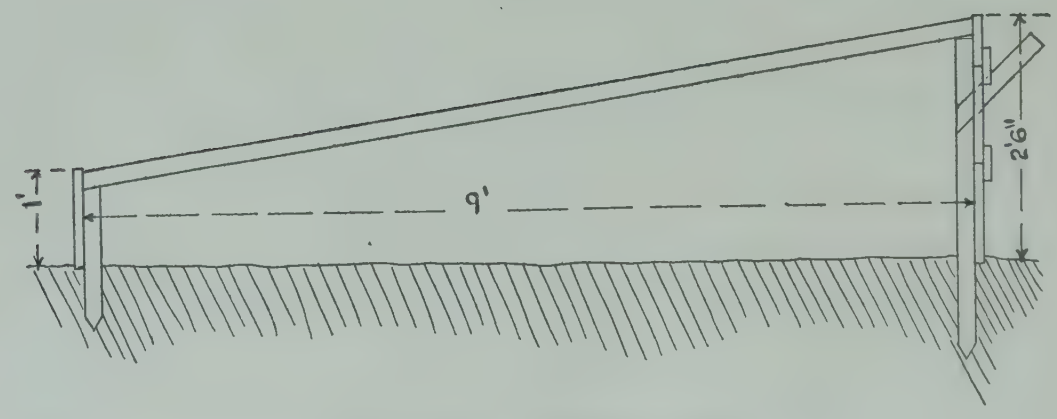
23 by 414 feet equals 9,522, or approximately 10,000 board feet per acre.

Estimating this material at $20 per 1,000 board feet, the wide frames would cost in the neighborhood of $200 per acre.

The sides and ends would be of clear heart pine, undressed, and the posts and rafters of hard wood, undressed, preferably of oak.



Ground Plan of Narrow Frame.



Plan 2. End Elevation of Narrow Frame.

MATERIALS REQUIRED FOR SINGLE OR NARROW FRAMES.

Sides, ends, rafters, posts.
Estimating 36 frames, 100 feet long, per acre.

	Board Feet.
Front, 100 (12 inches by 1 inch)	100
Back, 200 (12 inches by 1 inch)	200
Back, 100 (6 inches by 1 inch)	50
Back, 200 (3 inches by 1 inch)	50
Ends, 2 (12 inches by 1 inch by 9 feet)	18
Back, 2 (9 inches by 1 inch by 9 feet)	14
Rafters, 17 (2 inches by 1 inch by 9 feet)	25
Posts, 17 (2 inches by 2 inches by 40 inches)	19
Posts, 17 (2 inches by 2 inches by 20 inches)	10
Total per frame	486

36 by 486 feet equals 17,496 board feet per acre.

At $20 per 1,000 board feet, the narrow frames would cost approximately $350 per acre.

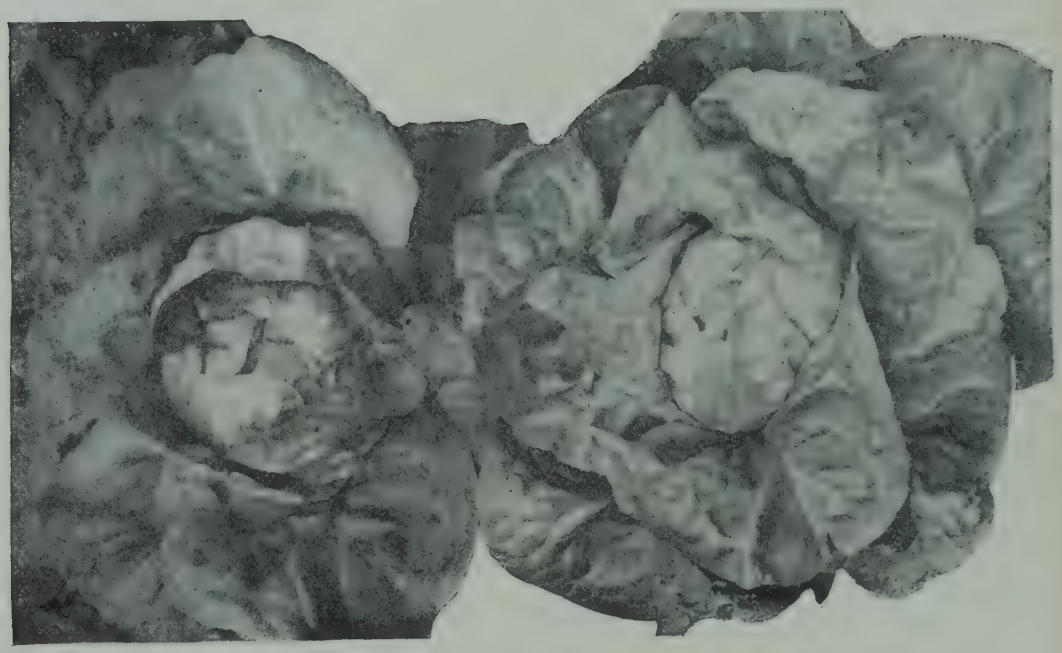


Fig. 1.—Well-grown heads in bed before cutting. One-fourth natural size.

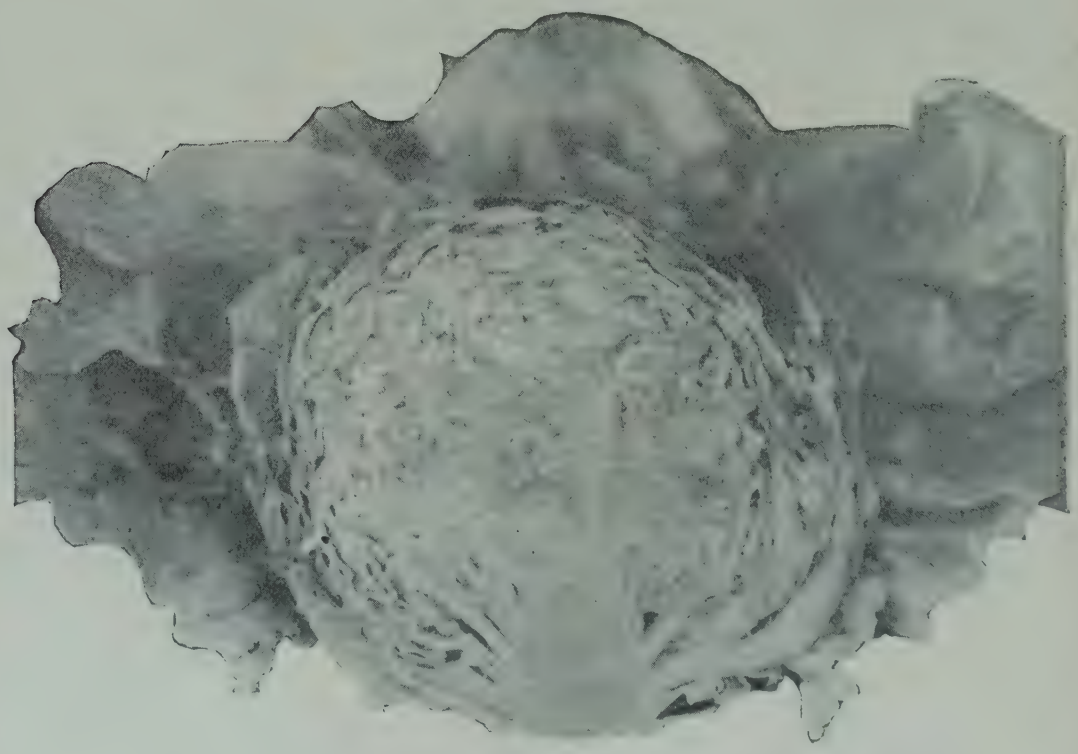


Fig. 2.—Cross-section of well-grown head of Big Boston Lettuce.

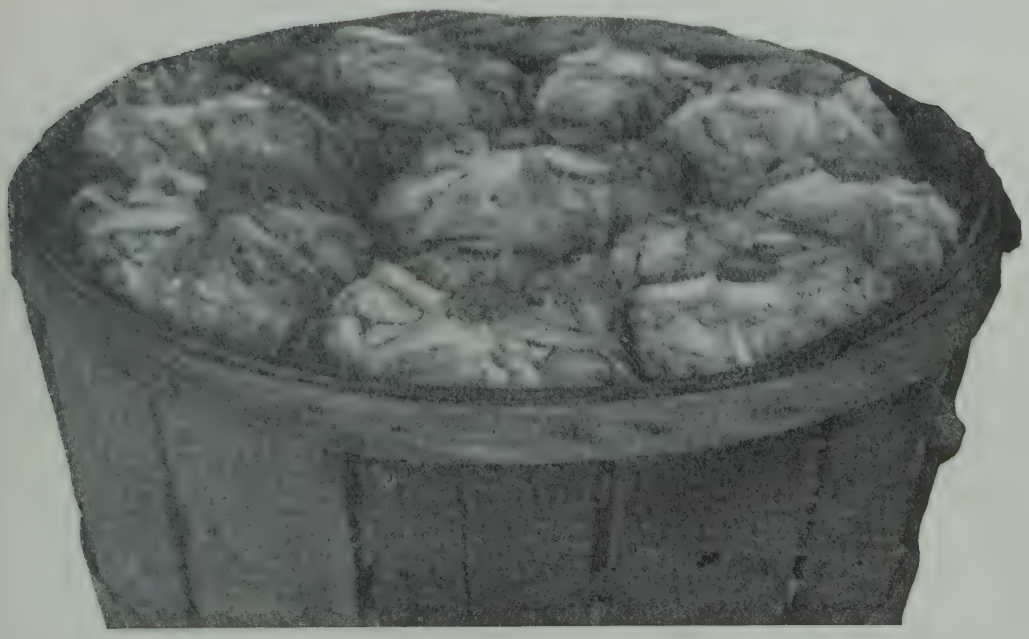


Fig. 3.—Properly packed basket ready for cover.

Fig. 4.—Lettuce packed ready for shipment.

Fig. 5.—Cutting and packing Lettuce. Truck Test Farm, Pender County, N. C.

Fig. 6.—Main irrigating pipe with lateral connections, showing cut-off valve, lever and slip joint.

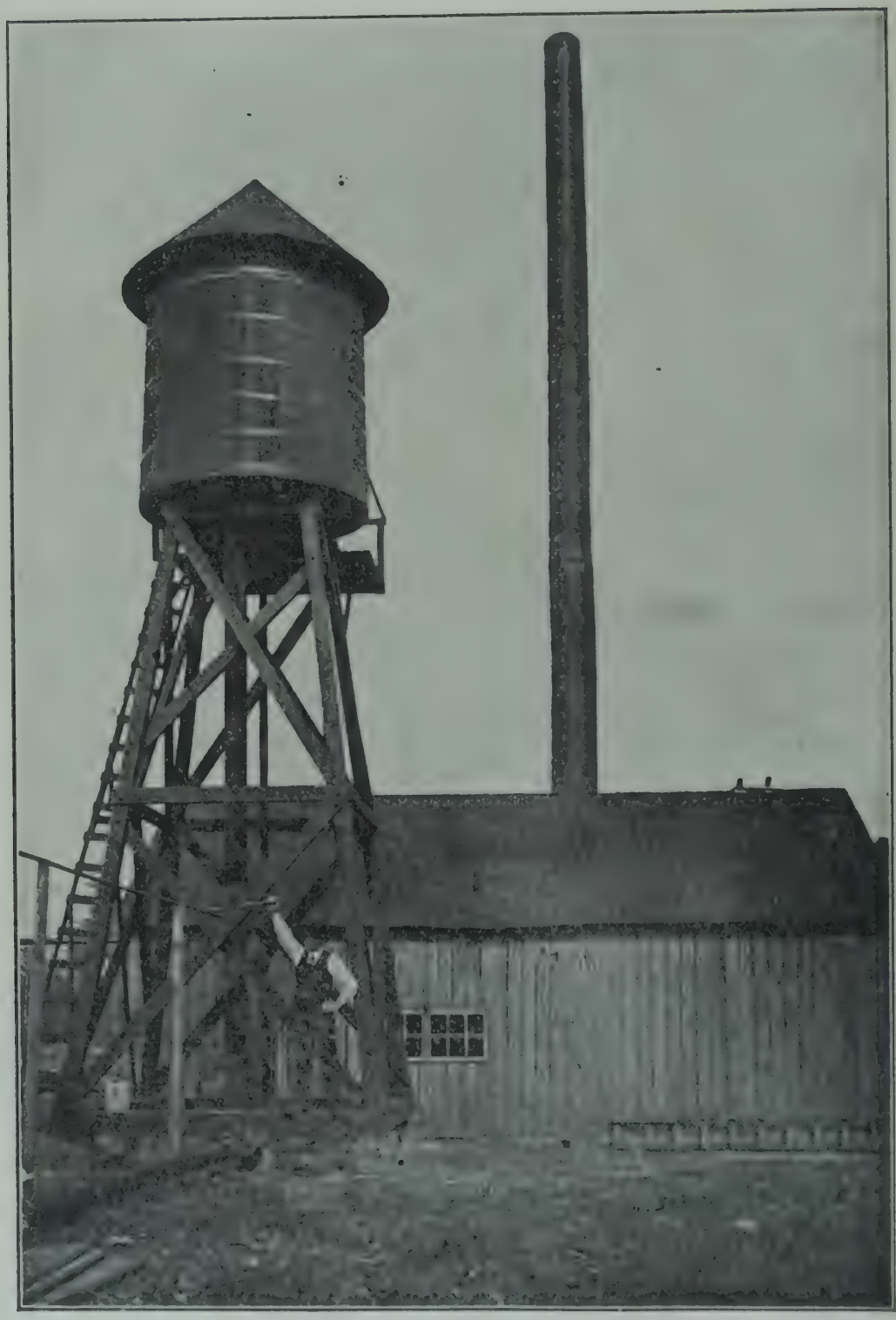


Fig. 7.—Engine house and supply tank, showing lever for directing spray from lateral irrigation pipe.

Fig. 8.—Steam Lettuce-growing. New Bern, N. C.

Fig. 9.—Shipping Lettuce. New Bern, N. C.

Fig. 10.—Narrow trades with steam boat New Bern, N. C.

Fig. 11.—Lettuce growing in city lot. Fayetteville, N. C.

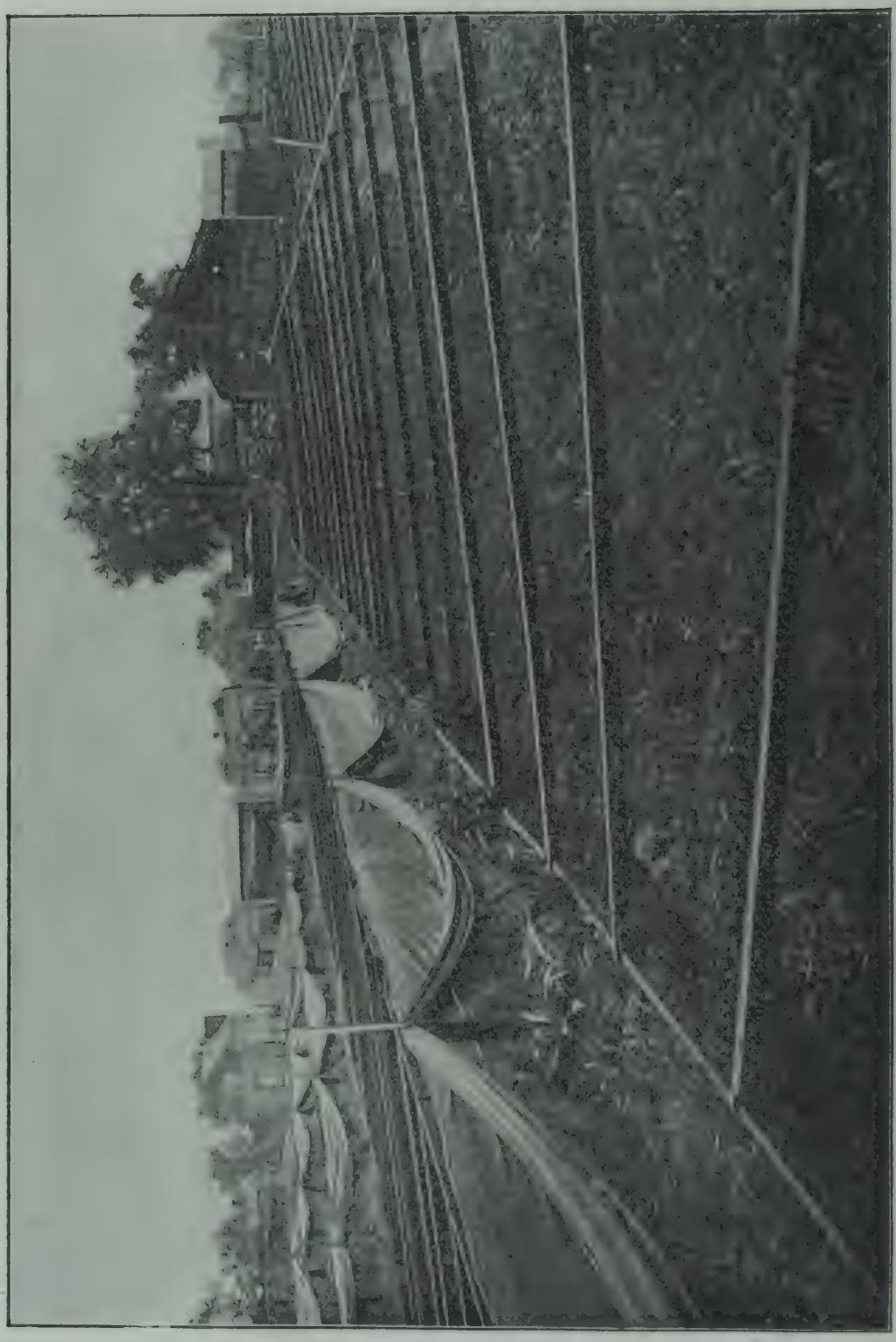


Fig. 12.—Lettuce frames on small suburban place. Fayetteville, N. C.

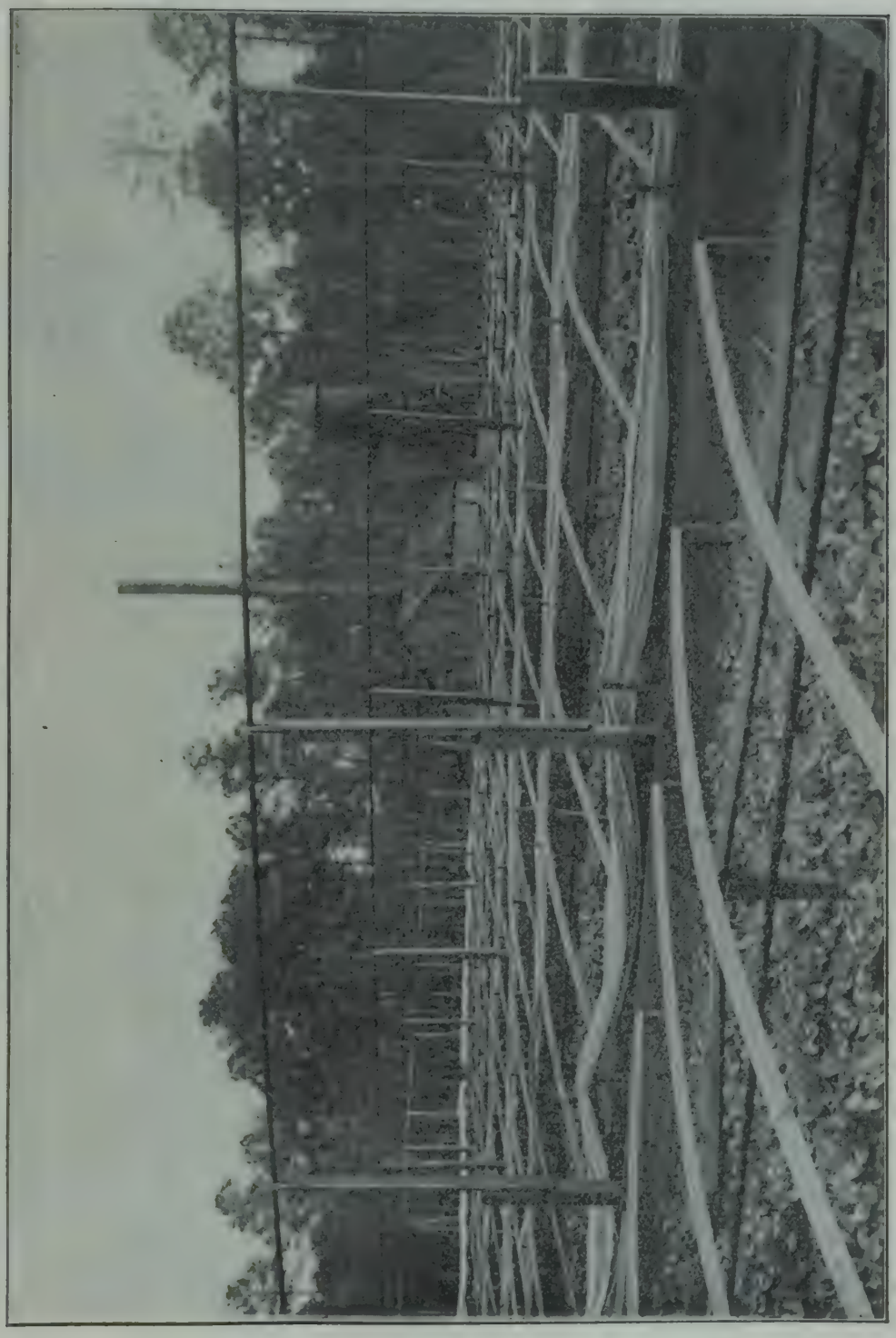


Fig. 13.—Lettuce culture in wide frames, showing heating and irrigating pipes. Truck Test Farm, Pender County, N. C.

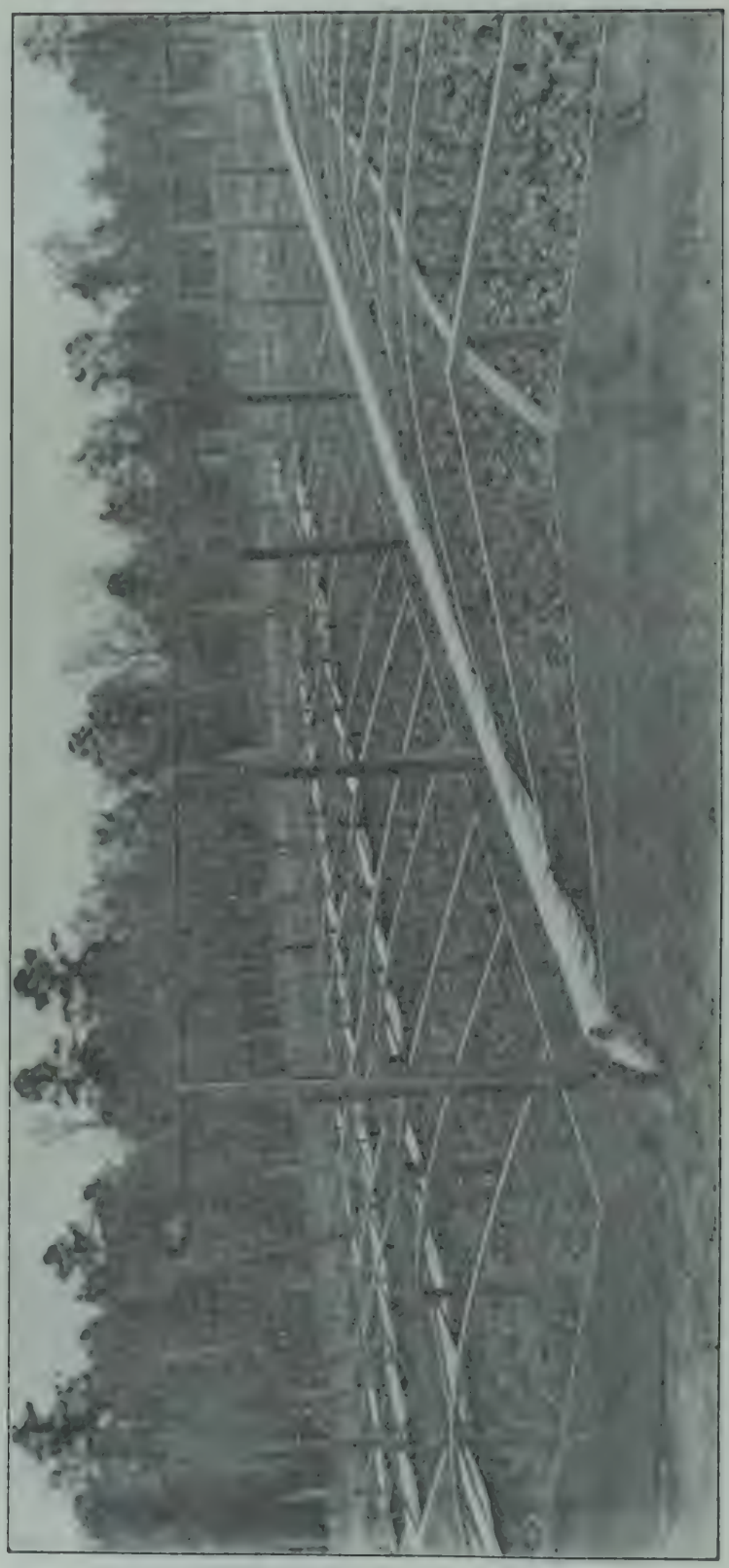


Fig. 14.—Lettuce growing in wide frames under Skinner irrigation system. Covers reefed to admit sunlight. Truck Test Farm, Pender County, N. C.

Fig. 15.—Lettuce in wide frames without heat. Wilmington, N. C.

Fig. 16.—Lettuce in narrow frames without heat and irrigation. Wilmington, N. C.

Fig. 17.—Wide frames without heat. Wilmington, N. C.

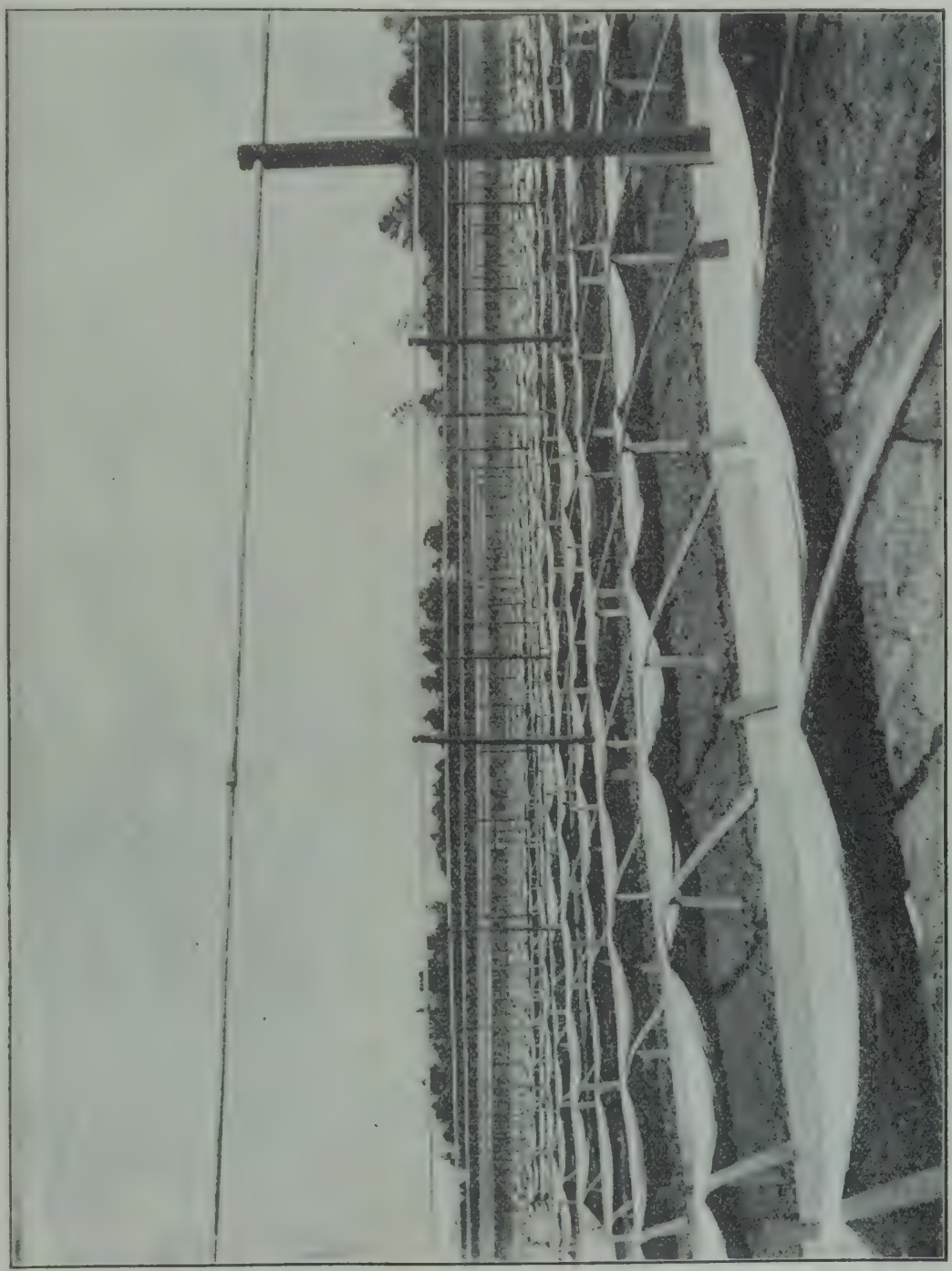


Fig. 18.—Lettuce frames with overhead irrigation, but without heating pipes. Wilmington, N. C.

EIGHTH (PARTIAL[1]) REPORT OF THE WORK ON THE DEPARTMENT TEST FARMS FOR SEASON 1907.[2]

INCLUDING

VARIETY AND DISTANCE TESTS OF CORN AND COTTON.

B. W. KILGORE, STATE CHEMIST, FIELD CROPS.

By G. M. MACNIDER, SOIL WORK,

AND

R. W. SCOTT, JR., SUPERINTENDENT EDGECOMBE TEST FARM,
F. T. MEACHAM, SUPERINTENDENT IREDELL TEST FARM,
R. W. COLLETT, SUPERINTENDENT TRANSYLVANIA TEST FARM.

On the following pages are recorded the results of this year's work with the variety and distance tests of corn and cotton on the Department's Test Farms.

Corn and Cotton Plats—Edgecombe Test Farm.

The testing of these two factors in the production of cotton and corn is of the most fundamental importance, as is evidenced by the difference in yield of different varieties and of different distancing when grown side by side in the

[1]The main portion of the work for 1902, 1903, 1904, 1905, 1906 and 1907 is reserved for publication later, when the results of our tests, which have now been running some six or seven years, will be brought together, with the view of drawing such conclusions as may be warranted on the subjects covered by the experiments.

[2]Thanks are due Mr. C. B. Williams, Director of the Agricultural Experiment Station, West Raleigh, for valuable assistance in the preparation of this BULLETIN.

same field, on the same type of soil, with identical cultivation and fertilization. Its importance is further emphasized when it is considered that 64.7 per cent (17.5 per cent to cotton and 47.2 per cent to corn) of the cultivated lands of North Carolina are devoted to these two crops, with the small average annual yields of 215 pounds of lint cotton and 12.8 bushels shelled corn per acre. If, by carefully conducted experiments through a number of years, the most advantageous distancing and most prolific varieties of corn and cotton on the different types of soil for an average season can be ascertained, and farmers generally be induced to use the best varieties and distances in growing these crops, material assistance will have been rendered in increasing the total amounts per acre of these crops grown in the State. Increasing the average yield of corn one bushel and seed cotton fifty pounds per acre will, according to the census of 1900, increase the annual profits of the farmers of North Carolina by about $3,650,000, allowing sixty cents per bushel for shelled corn and three and one-half cents per pound for seed cotton. This does not appear, with the hearty co-operation of farmers, such a far-distant possibility, in the light of results obtained during the past seven years in our testing of varieties of corn and cotton. Take, for example, the results of our variety tests at the Edgecombe farm[3] during this time. In comparative variety tests of corn, with the number of varieties in the different tests varying from eight to thirty-six, we have found the differences between the one yielding the highest and the one the lowest amount of shelled corn per acre in the individual test to range from 6.2 to 26.6 bushels. With cotton the range of difference in the different tests has been all the way from 530 to 915 pounds of seed cotton per acre, when from seven to twenty-six varieties were used in the different tests. It must not be forgotten that the best distancing of any crop is principally dependent upon soil fertility, while yield of variety is governed largely by soil fertility and adaptability and by the rigidity with which selection of seed of desirable characteristics has been made.

LOCATION AND CHARACTER OF SOILS OF TEST FARMS.

Edgecombe Farm.—This farm is located in Edgecombe County, about midway between the towns of Tarboro and Rocky Mount, and about two miles from Kingsboro, a station on the Atlantic Coast Line Railway. The soil of this farm consists, principally, of sandy loam, with moderately fine sand, underlain by a rather tenacious sandy clay subsoil at a depth, generally, of from 8 to 12 inches. The subsoil is a moderately good sandy clay, such as is found under the larger portion of the lands of the eastern part of the State. This type of soil responds very rapidly in remunerative crops to proper fertilization and cultivation, and represents a large and important part of the coastal plain formation, which comprises something like forty per cent of the total area of the State. The types of soil on this farm are designated by the Bureau of Soils of the United States Department of Agriculture as Norfolk sandy loam and Norfolk fine sandy loam.

Red Springs Farm.—This farm is located in the coastal plain region, about one mile east of the corporate limits of the town of Red Springs, in Robeson County. The soil is a rather deep phase of Norfolk sandy loam, a gray medium sandy loam underlain at from 12 to 15 inches by a yellow sandy clay

[3]The results at the Edgecombe farm are taken for these comparisons because, it being the oldest farm, we have data for a greater number of years.

subsoil. This type of soil is found in considerable areas in the middle-eastern and southeastern portions of the State, and being of a dry nature and warming up early in the spring, it is especially adapted to the growth of truck and other crops where early maturity is an important consideration. Although this soil is not as strong as that found on the Edgecombe farm, it will produce good yields under liberal fertilization and proper cultivation and rotation of crops.

Iredell Farm.—This farm, located in the Piedmont section of the State, lies about one and one-half miles northwest of the corporate limits of Statesville, and is bisected by the Statesville and western division of the Southern Railway. The soils consist of Cecil clay and Cecil sandy loam, which are the predominant types throughout the Piedmont Plateau. The surface soil of the Cecil sandy loam is a grayish brown sandy loam, while that of the Cecil clay is a deep red tenacious clay. Both are underlain by a heavy red clay subsoil. These soils are naturally strong and are susceptible of high productivity under judicious fertilization and proper cultural management. They are especially adapted to the growth of grains, grasses and clover.

Transylvania Farm.—This farm is located at Blantyre, on the west side of the French Broad River, twelve miles directly west of Hendersonville, and is situated on both sides of the Hendersonville and Lake Toxaway branch of the Asheville and Spartanburg division of the Southern Railway. The farm embraces both valley and mountain-side soils. The valley soil consists of a dark, heavy loam, containing organic matter and a liberal supply of plant-food constituents; it is known as Toxaway loam. This soil, which is typical of large areas of soil in the French Broad Valley, is deep and fertile, and generally produces large yields when not subject to too great overflows during the growing season. The mountain-side soil consists of a grayish to dark red loam, underlain at from 6 to 12 inches by a stiff clay loam; it is known as Porter's loam. Both soil and subsoil contain some rock fragments. This is one of the typical soils of the mountains of western North Carolina. It washes badly if not covered by forest or carefully looked after when cultivated. This soil, when not too steep, is devoted to some extent to general farming and fruit growing.

I. Variety, Variety-distance and Distance Tests of Corn.

Preparation and Cultivation.—The plats were all broke alike with a two-horse turning plow 8 to 10 inches deep and harrowed. Soon after the rows were run 4 to 5 inches deep and 4 feet apart in variety tests and the several distances in the distance tests. The stalks in the variety tests were reduced to a stand of 2½ feet in the row.

The fertilizer materials were applied uniformly in these drills and covered, the application being at the following rate per acre in all tests:

Three hundred pounds of a mixture of acid phosphate, dried blood and manure salt,[1] which contained 7 per cent available phosphoric acid, 1½ per cent potash and 3 per cent nitrogen (equal to 3.64 per cent ammonia), costing $3.12, were used.

The slight ridges formed in covering the fertilizer were opened and the corn planted a little below the level, all tests of the same kind at the same farm being given the same treatment as to time of planting and otherwise. All

[1]Manure salt is a potash compound containing about 20 per cent potash, principally in the form of muriate.

cultivations were as nearly level as possible and rather deep early in the season, with the small hoes of the Planet Jr. Cultivator, but became shallower, using the large hoes as the season advanced and the roots extended towards the middle of the rows and nearer the surface. This system of cultivation afforded pretty thorough breaking of the land early in the season and prevented the disturbance of the root systems of the plants later. An effort was made to cultivate every ten or twelve days, as far as the weather would permit, and especially immediately after rains, in order to produce a fine dust mulch with the shallow-running plows, to retard the evaporation of the recently added moisture.

The varieties of corn were harvested and shocked on September 16 at the Edgecombe farm, on September 14 at the Iredell farm, but were not husked until December 3 and 4 at Edgecombe, November 7 at Iredell.

RESULTS OF VARIETY TESTS OF CORN.

The results of these tests are contained in the following tables:

TABLE I—RESULTS OF

EDGECOMBE

Rank in Productivity.		Varieties Tested.	Number Stalks per Plat.		Date of Tasseling.	Average Height in Inches at Maturity.		Number of Ears per Plat.	Average Number of Ears per Stalk.	Yield per Plat.	
Shelled Corn.	Stover.		For Perfect Stand.	By Actual Count.		Stalks.	Ears.			Large Ears—Pounds.	Nubbins—Pounds.
1	14	Wyatt's Improved Yellow	196	178	July 25	112.0	53.0	182	1.02	70.50	13.50
2	13	Cocke's Prolific	196	172	" 27	108.0	49.0	232	1.34	69.75	12.75
3	6	Weekley's Improved	196	219	" 25	105.0	50.0	291	1.32	66.50	13.00
4	20	Marlboro Prolific	196	188	" 25	102.0	42.0	243	1.29	73.25	6.00
5	1	Jarvis' Improved	196	162	" 20	110.0	50.0	180	1.11	67.75	7.75
6	21	Biggs' Seven Ear	196	195	" 27	106.0	46.0	306	1.56	64.00	14.75
7	29	American Queen	196	162	" 27	99.0	43.0	236	1.45	63.75	10.75
8	24	Pool's	196	184	" 25	96.0	36.0	217	1.17	58.00	11.75
9	23	Boone County White	196	165	" 20	102.0	42.0	171	1.03	66.50	5.50
9	31	Six-ear Corn	196	158	" 27	108.0	52.0	225	1.42	66.50	5.50
10	34	Boone County White	196	171	" 22	99.0	40.0	154	.90	45.00	24.00
10	18	Hickory King	196	176	" 24	97.0	39.0	200	1.13	54.00	11.00
11	7	Cocke's Prolific	196	202	" 24	107.0	47.0	252	1.24	53.00	15.00
12	30	Reid's Yellow Dent	196	158	" 20	97.0	39.0	142	.89	55.25	10.50
13	33	Riley's Favorite	196	184	" 18	95.0	34.0	173	.94	60.50	6.00
14	8	Williams'	196	177	" 26	108.0	51.0	150	.84	60.75	10.00
15	16	Hickory King	196	204	" 23	93.0	40.0	217	1.06	53.50	9.50
16	26	Wilson's Success	196	160	" 26	113.0	52.0	208	1.30	57.25	9.75
17	28	Parker's Cocke's Prolific	196	156	" 25	96.0	41.0	204	1.30	56.25	7.25
18	19	Sanders' Improved	196	147	" 28	106.0	49.0	169	1.14	52.75	5.25
18	17	Sharber's	196	161	" 22	97.0	44.0	186	1.15	55.50	8.75
18	9	Marlboro Prolific	196	151	" 25	106.0	49.0	212	1.40	50.00	11.50
19	10	Southern Beauty	196	173	" 24	104.0	46.0	156	.90	50.50	9.25
20	3	Fry's Improved	196	189	" 25	110.0	53.0	166	.87	50.50	8.50
20	32	Farmers' Favorite	196	131	" 22	109.0	45.0	132	1.00	52.50	8.00
21	12	Brakes'	196	160	" 25	109.0	47.0	139	.86	41.25	15.00
22	5	Holt's Strawberry	196	193	" 26	109.0	51.0	164	.85	45.50	12.50
22	27	Selection 77	196	180	" 23	97.0	39.0	170	.94	51.00	6.75
22	15	McMackin's Gourd Seed	196	182	" 24	104.0	47.0	163	.89	46.50	10.25
23	4	Iowa Silver Mine	196	143	" 23	72.0	28.0	126	.88	44.50	11.75
24	23	Leaming Yellow	196	164	" 20	90.0	35.0	160	.97	49.50	7.50
25	25	Boone County Special	196	173	" 22	97.0	37.0	159	.91	49.25	6.00
26	7	Hastings' Prolific	196	211	" 30	109.0	51.0	254	1.20	38.00	15.00
27	22	Bradbury's Improved	196	179	" 26	103.0	47.0	172	.90	40.25	11.00
28	2	Henry Grady	196	172	" 25	118.0	58.0	165	.95	44.50	8.25
29	11	Mosby's Prolific	196	196	" 28	104.0	53.0	191	.97	37.00	9.00

VARIETY TESTS OF CORN.

FARM.

Yield per Acre.		Ears.				Shelling Capacity.		Total Weight.				
Ears—Pounds.	Shelled Corn—Bushels.	Number Ears to Shell One Bushel.	Pounds Ears (Grain and Cob) to Shell One Bushel.	Average Length—Inches.	Average Circumference—Inches.	Grain—Per Cent.	Cob—Per Cent.	Ears—Per Cent.	Stover—Per Cent.	Stover per Acre—Pounds.	Weight in Pounds of Measured Bushel of Shelled Corn.	Source of Seed.
1864.8	27.0	106	71.5	8.70	6.90	81.1	18.9	54.1	45.9	1576	58.00	North Carolina.
1831.5	26.5	156	79.5	8.00	6.60	81.1	18.1	53.2	46.8	1610	64.50	Tennessee.
1764.9	26.2	166	71.5	7.50	6.00	83.2	16.8	45.4	54.6	2120	59.50	Iredell Test Farm.
1759.3	25.7	170	73.0	7.50	5.90	82.1	17.9	56.8	43.1	1384	60.00	S. Carolina (B. P. I.).
1076.1	25.2	104	68.0	8.10	7.20	84.5	15.5	43.1	56.9	2909	57.50	North Carolina.
1748.2	24.8	206	74.0	6.25	5.37	79.5	20.5	60.5	39.5	1338	58.50	North Carolina.
1653.9	24.1	168	74.5	7.20	6.30	81.8	18.2	59.5	40.5	1121	61.00	North Carolina.
1548.4	24.0	154	73.5	6.90	5.80	87.0	13.0	55.8	44.2	1227	64.00	Georgia.
1598.4	23.6	110	70.0	8.70	7.20	82.8	17.2	55.3	44.7	1287	58.00	Tennessee.
1598.4	23.6	110	70.0	8.70	7.20	82.8	17.2	60.0	40.0	1066	58.00	Georgia.
1531.8	22.9	108	72.0	8.60	7.00	84.0	16.0	65.7	34.3	799	60.50	Indiana.
1443.0	22.9	150	70.0	6.70	6.00	89.2	10.8	50.0	50.0	1443	62.50	Virginia.
1509.6	22.4	162	77.5	7.50	5.80	83.2	16.8	43.8	56.2	1931	64.50	Edgecombe Test Farm.
1459.6	22.2	116	69.0	8.30	5.60	85.5	14.5	57.1	42.9	1093	59.00	Illinois.
1476.3	22.0	132	68.0	8.00	6.50	83.8	16.2	63.3	36.7	855	57.00	Indiana.
1570.6	21.8	114	74.5	8.80	6.90	77.8	22.2	45.6	54.4	1870	58.00	North Carolina.
1398.6	21.5	136	65.5	7.70	6.10	86.2	13.8	48.4	51.6	1487	56.50	Tennessee.
1487.4	21.2	174	70.5	7.66	5.75	80.1	19.9	53.6	46.4	1176	56.50	Virginia.
1409.7	20.1	162	70.0	7.50	6.60	80.0	20.0	55.2	44.8	1143	56.00	North Carolina.
1287.6	19.8	136	69.0	7.10	7.20	86.2	13.8	48.3	51.7	1376	59.50	Georgia.
1426.3	19.8	114	74.5	7.60	6.75	77.8	22.2	49.4	50.6	1460	58.00	North Carolina.
1365.3	19.8	154	73.5	6.80	6.05	81.6	18.4	42.4	57.6	1854	60.00	South Carolina.
1326.4	19.5	84	65.5	7.80	7.80	82.4	17.6	42.2	55.8	1671	54.00	North Carolina.
1309.8	19.4	114	74.0	8.25	6.90	83.2	16.8	33.7	66.3	2575	62.00	Georgia.
1343.1	19.4	112	72.5	9.20	6.60	81.3	18.7	57.6	42.4	988	59.00	North Carolina.
1248.7	19.1	130	72.0	7.50	6.80	86.1	13.9	43.2	56.8	1637	62.00	North Carolina.
1287.6	19.0	96	71.0	8.40	7.60	83.0	17.0	36.2	63.8	2264	59.00	Virginia.
1282.0	19.0	128	66.0	7.90	6.60	83.3	16.7	52.5	47.5	1159	55.00	Ohio.
1259.8	19.0	96	65.5	7.00	7.50	84.7	15.3	45.4	54.6	1515	55.50	Tennessee.
1248.7	18.9	120	74.0	8.00	6.90	85.1	14.9	34.0	66.0	2414	63.00	Illinois.
1265.4	18.8	130	70.0	8.10	6.60	83.5	16.5	49.7	50.3	1287	58.50	Ohio.
1226.5	18.0	112	65.5	7.90	6.90	82.4	17.6	50.2	49.8	1215	54.00	Illinois.
1176.6	17.9	192	73.0	6.80	5.90	85.6	14.4	37.8	62.2	1931	62.50	Georgia.
1137.7	17.4	112	68.5	7.40	7.00	86.1	13.9	46.5	53.5	1304	59.00	Georgia.
1171.0	17.2	96	62.0	7.30	7.60	82.2	17.8	31.0	69.0	2603	51.00	Georgia.
1021.2	15.7	152	66.5	7.20	6.00	86.4	13.6	38.3	61.7	1642	57.50	Mississippi.

TABLE I—RESULTS OF VARIETY

IREDELL

Rank in Productivity.		Varieties Tested.	Number Stalks per Plat.		Date of Tasseling.	Average Height in Inches at Maturity.		Number of Ears per Plat.	Average Number of Ears per Stalk.	Yield per Plat.	
Shelled Corn.	Stover.		For Perfect Stand.	By Actual Count.		Stalks.	Ears.			Large Ears—Pounds.	Nubbins—Pounds.
1	21	Biggs' Seven Ear	218	128	July 26	114.0	60.0	264	2.06	138.50	20.00
2	25	American Queen	218	128	" 25	130.0	54.0	237	1.85	142.00	12.00
3	11	Southern Beauty	218	133	" 24	130.0	48.0	157	1.18	138.00	6.00
4	20	Pool's	218	141	" 18	114.0	54.0	201	1.42	126.50	11.00
5	22	Boone County White	218	146	" 18	108.0	54.0	140	.95	129.50	5.00
6	7	Cocke's Prolific	218	132	" 24	126.0	72.0	266	2.01	125.50	11.00
7	15	Marlboro Prolific	218	129	" 25	108.0	48.0	221	1.70	120.00	18.00
8	19	Selection 77	218	123	" 18	116.0	54.0	143	1.16	118.50	8.00
9	23	Goodman's Prolific	218	102	" 26	102.0	48.0	222	2.17	117.00	5.00
10	16	Jarvis' Improved	218	148	" 22	124.0	54.0	137	.92	110.00	14.50
10	10	Wilson's Success	218	108	" 20	108.0	60.0	217	2.00	122.50	16.00
11	2	Henry Grady	218	137	" 20	125.0	66.0	150	1.94	118.00	15.00
12	31	Parker's Cocke's Prolific	218	123	" 20	120.0	66.0	220	1.78	122.00	9.00
13	3	Brakes'	218	149	" 20	122.0	60.0	125	.83	108.50	15.00
13	26	Boone County Special	218	138	" 18	116.0	66.0	137	.99	108.50	12.00
14	13	Hickory King	218	148	" 18	97.0	60.0	156	1.05	119.00	2.00
15	9	Weekley's Improved	218	130	" 25	114.0	60.0	206	1.58	105.00	18.00
15	6	Cocke's Prolific	218	119	" 20	124.0	60.0	169	1.42	103.00	18.00
16	18	Sanders' Improved	218	168	" 22	120.0	72.0	180	1.70	109.50	8.00
17	4	Fry's Improved	218	127	" 20	130.0	72.0	142	1.10	104.50	17.00
18	14	McMackin's Gourd Seed	218	162	" 20	100.0	60.0	138	.85	107.50	10.00
19	1	Holt's Strawberry	218	138	" 20	126.0	66.0	122	.88	114.00	6.00
20	24	Wyatt's Improved	218	126	" 25	120.0	60.0	137	1.87	114.50	8.00
21	30	Currituck	218	138	" 22	116.0	60.0	135	.97	104.50	12.00
22	28	Sharber's	218	138	" 20	122.0	66.0	133	.95	105.50	7.50
23	27	Boone County White	218	122	" 22	102.0	60.0	126	1.83	109.50	8.00
24	12	Hickory King	218	128	" 22	120.0	60.0	163	1.27	103.00	7.00
25	29	Iowa Silver Mine	218	143	" 15	99.0	48.0	143	1.00	103.00	7.00
26	8	Williams'	218	132	" 26	124.0	66.0	123	.93	106.50	11.00
27	23	Farmers' Favorite	218	119	" 18	120.0	72.0	123	1.03	106.00	6.00
28	21	Bradbury's Improved	218	118	" 25	120.0	72.0	145	1.22	92.50	11.00
29	32	Leaming Yellow	218	129	" 15	106.0	60.0	133	1.03	98.00	9.00
30	5	Mosby's Prolific	218	128	" 25	106.0	60.0	178	1.39	85.00	12.00
31	17	Six-ear Corn	218	115	" 26	114.0	66.0	230	2.00	75.50	19.00
32	15	Hastings' Prolific	218	124	" 26	127.0	72.0	180	1.45	81.00	12.00
33	32	Reid's Yellow Dent	218	123	" 18	111.0	48.0	129	1.04	88.00	4.00
34	34	Riley's Favorite	218	130	" 15	120.0	72.0	135	1.03	74.00	3.00

TESTS OF CORN—CONTINUED.

FARM.

Yield per Acre.		Number Ears to Shell One Bushel.	Pounds Ears (Grain and Cob) to Shell One Bushel.	Ears.		Shelling Capacity.		Total Weight.		Stover per Acre—Pounds.	Weight in Pounds of Measured Bushel of Shelled Corn.	Source of Seed.
Ears—Pounds.	Shelled Corn—Bushels.			Average Length—Inches.	Average Circumference—Inches.	Grain—Per Cent.	Cob—Per Cent.	Ears—Per Cent.	Stover—Per Cent.			
3170.0	46.9	210	67.5	7.00	5.75	83.0	17.0	53.7	46.3	2730	------	North Carolina.
3180.0	45.1	183	68.2	7.00	6.00	82.0	18.0	55.0	45.0	2520	------	North Carolina.
2880.0	43.7	118	65.9	8.00	6.75	85.0	15.0	47.2	52.8	3220	------	North Carolina.
2750.0	43.2	162	63.6	9.00	6.00	88.0	12.0	46.2	53.8	2750	------	Georgia.
2690.0	40.3	117	66.7	9.00	6.75	84.0	16.0	49.8	50.2	2710	------	Indiana.
2730.0	39.6	199	68.9	8.25	6.00	81.0	19.0	43.3	55.7	3470	------	Edgecombe Farm.
2760.0	39.4	198	70.0	7.00	6.25	80.0	20.0	44.6	55.4	3140	------	South Carolina.
2530.0	38.9	125	65.0	8.25	6.75	86.0	14.0	47.7	52.3	2770	------	Ohio.
2440.0	38.7	156	63.0	8.25	5.75	89.0	11.0	48.8	51.2	2560	------	North Carolina.
2490.0	38.2	119	58.1	7.50	7.50	86.0	14.0	44.1	55.9	3110	------	North Carolina.
2770.0	38.2	111	72.5	8.00	6.00	81.0	19.0	46.1	53.1	3230	------	Virginia.
2660.0	38.0	114	70.0	9.25	7.00	80.0	20.0	39.1	60.9	4140	------	Georgia.
2620.0	37.8	168	69.3	7.50	6.75	81.0	19.0	58.2	41.8	1880	------	North Carolina.
2470.0	37.0	112	66.7	7.50	7.25	84.0	16.0	37.4	62.6	4130	------	North Carolina.
2410.0	37.0	119	65.1	8.75	7.25	86.0	14.0	49.1	50.9	2490	------	Illinois.
2420.0	36.7	108	65.9	8.00	6.00	85.0	15.0	43.2	56.8	3180	------	Tennessee.
2460.0	36.4	140	67.5	8.50	6.50	83.0	17.0	42.0	57.6	3340	------	Iredell Farm.
2520.0	36.4	163	68.1	9.25	6.25	81.0	19.0	39.6	60.4	3680	------	Tennessee.
2350.0	36.0	164	65.2	7.50	6.00	86.0	14.0	45.1	54.9	2850	------	Georgia.
2430.0	35.5	122	68.4	8.25	6.00	82.0	18.0	37.3	62.7	4070	------	Georgia.
2350.0	35.2	122	66.7	8.25	7.00	84.0	16.0	42.6	57.4	3150	------	Tennessee.
2400.0	35.1	120	68.3	9.25	7.50	82.0	18.0	35.2	64.8	4400	------	Virginia.
2450.0	35.0	117	70.0	8.75	6.50	80.0	20.0	49.0	51.0	2550	------	North Carolina.
2330.0	34.9	122	66.7	7.00	6.75	84.0	16.0	54.1	45.9	1970	------	North Carolina.
2260.0	34.7	169	65.1	7.00	6.25	86.0	14.0	50.2	49.8	2240	------	North Carolina.
2350.0	34.4	120	68.3	8.00	6.75	82.0	18.0	50.0	50.0	2350	------	Tennessee.
2200.0	33.7	120	65.2	8.00	5.75	86.0	14.0	47.0	52.6	3200	------	Virginia.
2200.0	33.0	133	66.6	8.00	7.50	84.0	16.0	52.3	47.7	2000	------	Illinois.
2350.0	32.7	117	71.8	9.00	6.50	78.0	22.0	45.1	54.9	3450	------	North Carolina.
2240.0	32.0	112	70.0	9.75	6.00	80.0	20.0	46.6	53.4	2560	------	North Carolina.
2070.0	31.7	151	65.3	7.50	7.25	86.0	14.0	43.1	56.9	2730	------	Georgia.
2140.0	31.3	136	68.3	7.50	7.00	82.0	18.0	54.9	45.1	1760	------	Ohio.
1940.0	30.1	164	64.4	8.00	5.75	87.0	13.0	33.4	66.6	3860	------	Mississippi.
1890.0	28.6	229	63.6	7.00	6.00	85.0	15.0	31.4	68.6	2920	------	Georgia.
1860.0	28.2	200	65.9	7.25	6.00	85.5	15.0	37.2	62.8	3140	------	Georgia.
1840.0	27.9	121	65.9	8.00	6.75	85.0	14.5	51.1	48.9	1760	------	Illinois.
1540.0	21.3	128	72.3	7.75	6.75	84.0	16.0	48.1	51.9	1660	------	Indiana.

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.
Cocke's Prolific (Edgecombe)	20.0	2	28.1	2	35.2	1	24.4	1	30.3	5	35.9	1	59.3	1	22.4	11	31.9	1
Cocke's Prolific (Tenn.)	----	----	----	----	----	----	19.9	7	26.4	12	26.8	14	41.9	9	26.5	2	..	..
Weekley's Improved,	19.4	3	29.5	1	33.5	2	19.5	10	25.5	13	35.5	2	53.1	2	26.2	3	30.2	2
Pool's	----	----	----	----	26.1	5	19.7	8	----	----	31.5	5	----	----	24.0	8	..	..
Craig's Prolific Strawberry.	----	----	----	----	29.1	3	16.1	16	27.8	8	----	----	----	----	----	----	----	----
Sanders' Improved	17.8	4	27.0	3	27.1	4	15.3	17	31.0	3	31.8	4	44.2	4	19.8	18	26.7	3
Holt's Strawberry	22.4	1	25.7	6	24.9	6	16.2	15	18.6	25	30.6	7	42.7	6	19.0	22	25.0	4
Craig's Prolific White.	----	----	----	----	24.6	7	14.9	18	27.1	10	24.1	21	----	----	----	----	----	----
Champion White Pearl.	----	----	----	----	21.6	8	----	----	----	----	----	----	----	----	----	----	----	----
Cooley's Red Cob	17.2	6	----	----	20.6	10	----	----	----	----	----	----	----	----	----	----	----	----
Improved Golden Dent.	----	----	22.5	7	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Champion Dent	----	----	22.2	8	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hickory King (Tenn.)	----	----	21.4	9	----	----	20.1	6	----	----	31.2	6	40.9	11	21.5	15	----	----
Mosby's Prolific	17.4	5	----	----	----	----	----	----	23.4	18	23.9	22	37.7	17	15.7	29	----	----
Tatum's Choice	17.0	7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Shaw's Improved	16.2	8	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Tennessee Yellow	----	----	26.6	5	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Killebrew's (Native),	----	----	26.9	4	21.4	9	22.4	2	----	----	----	----	----	----	----	----	----	----
Leaming Yellow	----	----	----	----	20.0	12	21.1	4	24.6	15	24.1	21	33.6	29	18.8	24	----	----
Brakes'	----	----	----	----	20.5	11	13.7	19	28.5	7	26.9	13	40.4	13	19.1	21	----	----
Marlboro Prolific (B. P. I.)	----	----	----	----	----	----	17.6	13	32.3	2	27.9	11	42.1	8	19.8	18	..	..
Biggs' Seven Ear	----	----	----	----	----	----	21.4	3	32.4	1	----	----	52.2	3	24.8	6	----	----
Iowa Silver Mine	----	----	----	----	----	----	17.3	14	25.2	14	22.3	24	36.6	21	18.9	23	----	----
Reid's Yellow Dent	----	----	----	----	----	----	17.8	12	23.4	18	23.3	23	35.3	24	22.2	12	----	----
Riley's Favorite	----	----	----	----	----	----	19.6	9	22.8	20	24.6	18	35.2	25	22.0	13	----	----
Boone County White (Ind.)	----	----	----	----	----	----	19.4	11	26.8	11	23.3	23	37.6	18	22.9	10	----	----
Boone County White (Tenn.)	----	----	----	----	----	----	17.6	13	23.9	17	28.9	9	34.5	28	23.6	9	----	----
Number 167	----	----	----	----	----	----	16.2	15	----	----	----	----	----	----	----	----	----	----
Selection 77	----	----	----	----	----	----	20.2	5	24.5	16	29.5	8	37.0	20	19.0	22	----	----
Cocke's Prolific (Pou)	----	----	----	----	----	----	----	----	32.3	2	----	----	----	----	----	----	----	----
Williams'	----	----	----	----	----	----	----	----	30.5	4	24.1	21	40.7	12	21.8	14	----	----
Square Deal	----	----	----	----	----	----	----	----	29.6	6	25.0	17	----	----	----	----		

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN—CON.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.
Boone County Special.	----	----	----	----	----	----	----	----	27.3	9	25.2	16	34.6	27	18.0	25	----	----
McMackin's Gourd Seed.	----	----	----	----	----	----	----	----	23.3	19	25.9	15	43.2	5	19.0	22	----	----
Horse-tooth	----	----	----	----	----	----	----	----	22.3	21	----	----	----	----	----	----	----	----
Currituck	----	----	----	----	----	----	----	----	21.4	22	23.3	23	40.9	11	----	----	----	----
Thomas' Improved	----	----	----	----	----	----	----	----	20.6	23	32.4	3	32.7	30	----	----	----	----
Chester County Mammoth.	----	----	----	----	----	----	----	----	20.3	24	----	----	----	----	----	----	----	----
Hickory King (Va.)	----	----	----	----	----	----	----	----	----	----	28.1	10	34.8	26	22.9	10	----	----
Eureka	----	----	----	----	----	----	----	----	----	----	27.7	12	42.5	7	----	----	----	----
Peele's Prolific	----	----	----	----	----	----	----	----	----	----	24.6	18	37.4	19	----	----	----	----
Shellem's Prolific	----	----	----	----	----	----	----	----	----	----	24.5	19	40.2	14	----	----	----	----
Native	----	----	----	----	----	----	----	----	----	----	24.2	20	----	----	----	----	----	----
American Queen	----	----	----	----	----	----	----	----	----	----	----	----	41.1	10	24.1	7	----	----
Hastings' Prolific	----	----	----	----	----	----	----	----	----	----	----	----	39.6	15	17.9	26	----	----
Southern Beauty	----	----	----	----	----	----	----	----	----	----	----	----	38.0	16	19.5	19	----	----
Farmers' Favorite	----	----	----	----	----	----	----	----	----	----	----	----	35.8	22	19.4	20	----	----
Wilson's Success	----	----	----	----	----	----	----	----	----	----	----	----	35.7	23	21.2	16	----	----
Battle's Prolific	----	----	----	----	----	----	----	----	----	----	----	----	35.2	25	----	----	----	----
Wyatt's Improved Yellow.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27.0	1	----	----
Marlboro Prolific	----	----	----	----	----	----	----	----	----	----	----	----	----	----	25.7	4	----	----
Jarvis' Improved	----	----	----	----	----	----	----	----	----	----	----	----	----	----	25.2	5	----	----
Six-ear Corn	----	----	----	----	----	----	----	----	----	----	----	----	----	----	23.6	9	----	----
Parker's Cocke's Prolific.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	20.1	17	----	----
Sharber's	----	----	----	----	----	----	----	----	----	----	----	----	----	----	19.8	18	----	----
Fry's Improved	----	----	----	----	----	----	----	----	----	----	----	----	----	----	19.4	20	----	----
Bradbury's Improved.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	17.4	27	----	----
Henry Grady	----	----	----	----	----	----	----	----	----	----	----	----	----	----	17.2	28	----	----

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN—CON.

RED SPRINGS FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.
Native	22.4	1	14.1	4					18.3	1
Coman's Best	16.6	2								
Mosby's Prolific	15.4	3								
Bradbury's Improved	15.0	4								
Cocke's Prolific	14.4	5	15.3	3					14.9	2
Blount's Prolific	10.2	6								
Improved Golden Dent	10.0	7	14.1	5					12.1	4
Clarke's Mastodon	9.0	8								
Holt's Strawberry	8.4	9	17.3	2					12.9	3
Weekley's Improved			19.0	1						
Sanders' Improved			14.0	6						
Tennessee Yellow			13.5	7						
Hickory King (Tenn.)			12.4	8						
Champion Dent			11.3	9						

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN—CON.

IREDELL FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.
Biggs' Seven Ear	----	----	----	----	----	----	29.7	1	31.8	2	----	----	38.8	9	46.9	1	----	----
Craig's Prolific Strawberry.	----	----	----	----	----	----	24.7	2	26.0	6	----	----	----	----	----	----	----	----
Marlboro Prolific	----	----	----	----	----	----	24.3	3	----	----	33.5	12	40.2	6	39.4	7	----	----
Craig's Prolific White.	----	----	----	----	----	----	23.9	4	28.8	3	31.8	18	----	----	----	----	----	----
Cocke's Prolific (Tenn.)	----	----	----	----	----	----	23.5	5	22.5	14	35.2	9	32.7	21	36.4	15	30.0	3
Weekley's Improved	----	----	----	----	----	----	23.3	6	23.4	10	40.3	2	42.0	1	36.4	15	33.0	1
Mosby's Prolific	----	----	----	----	----	----	22.6	7	21.9	18	27.5	31	30.4	26	30.1	30.	26.1	9
Boone County White (Tenn.)	----	----	----	----	----	----	22.6	7	24.6	7	27.8	30	36.4	14	34.4	23	29.5	5
Holt's Strawberry	----	----	----	----	----	----	21.9	8	22.3	16	31.7	19	31.7	24	35.1	19	28.5	6
Riley's Favorite	----	----	----	----	----	----	21.9	8	20.4	22	28.7	27	36.7	12	21.3	34	25.8	10
Pool's	----	----	----	----	----	----	21.8	9	----	----	35.4	8	----	----	43.2	4	----	----
Sanders' Improved	----	----	----	----	----	----	21.7	10	23.5	9	33.4	13	35.7	15	36.0	16	30.0	3
Selection 77	----	----	----	----	----	----	21.2	11	22.9	12	29.7	25	35.3	16	38.9	8	29.6	4
Reid's Yellow Dent	----	----	----	----	----	----	20.8	12	21.5	19	31.3	20	32.4	22	27.9	33	26.7	8
Leaming Yellow	----	----	----	----	----	----	20.8	12	22.5	14	31.0	21	33.4	20	31.3	29	27.8	7
Hickory King (Tenn.)	----	----	----	----	----	----	20.7	13	----	----	38.1	6	39.6	8	36.7	14	----	----
Iowa Silver Mine	----	----	----	----	----	----	20.6	14	22.5	14	30.5	24	30.4	26	33.0	25	25.4	11
Boone County White Ind.)	----	----	----	----	----	----	19.9	15	24.2	8	32.8	14	33.9	19	40.3	5	30.2	2
Number 167	----	----	----	----	----	----	17.1	16	----	----	----	----	----	----	----	----	----	----
Brakes'	----	----	----	----	----	----	----	----	32.4	1	37.4	7	40.3	5	37.0	13	----	----
Cocke's Prolific (Edgecombe)	----	----	----	----	----	----	----	----	26.3	4	41.0	1	39.9	7	39.6	6	----	----
Horse-tooth	----	----	----	----	----	----	----	----	26.1	5	----	----	----	----	----	----	----	----
Currituck	----	----	----	----	----	----	----	----	23.3	11	30.9	22	34.5	18	34.9	21	----	----
Native	----	----	----	----	----	----	----	----	22.7	13	28.0	29	----	----	----	----	----	----
Thomas' Improved	----	----	----	----	----	----	----	----	22.5	14	38.8	4	37.9	11	----	----	----	----
Williams'	----	----	----	----	----	----	----	----	22.4	15	38.7	5	40.4	4	32.7	26	----	----
Boone County Special.	----	----	----	----	----	----	----	----	22.3	16	32.5	15	28.7	27	37.0	13	----	----
Shellem's Prolific	----	----	----	----	----	----	----	----	22.2	17	33.9	10	36.7	12	----	----	----	----
Pride of Burke	----	----	----	----	----	----	----	----	21.5	19	----	----	----	----	----	----	----	----
McMackin's Gourd Seed.	----	----	----	----	----	----	----	----	21.1	20	28.5	28	31.3	25	35.2	18	----	----
Parks' Large Yellow	----	----	----	----	----	----	----	----	21.1	20	----	----	----	----	----	----	----	----
Parks' White Beauty	----	----	----	----	----	----	----	----	20.3	23	----	----	----	----	----	----	----	----

TABLE II—COMPILED RESULTS OF VARIETY TESTS OF CORN—CON.

IREDELL FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.	Yield in Bushels Shelled Corn per Acre.	Rank in Productivity of Shelled Corn.
Square Deal	----	----	----	----	----	----	----	----	20.8	21	30.6	23	----	----	----	----	----	----
Hickory King (Va.)	----	----	----	----	----	----	----	----	----	----	33.8	11	----	----	33.7	24	----	----
Goodman's Prolific	----	----	----	----	----	----	----	----	----	----	32.3	16	----	----	38.7	9	----	----
Peele's Prolific	----	----	----	----	----	----	----	----	----	----	32.0	17	34.8	17	----	----	----	----
American Queen	----	----	----	----	----	----	----	----	----	----	39.2	3	40.8	2	45.1	2	----	----
Eureka	----	----	----	----	----	----	----	----	----	----	29.5	26	32.0	23	----	----	----	----
Farmers' Favorite	----	----	----	----	----	----	----	----	----	----	----	----	40.5	3	32.0	27	----	----
Battle's Prolific	----	----	----	----	----	----	----	----	----	----	----	----	38.7	10	----	----	----	----
Southern Beauty	----	----	----	----	----	----	----	----	----	----	----	----	36.6	13	43.7	3	----	----
Hastings' Prolific	----	----	----	----	----	----	----	----	----	----	----	----	32.7	21	28.2	32	----	----
Jarvis' Improved	----	----	----	----	----	----	----	----	----	----	----	----	----	----	38.2	10	----	----
Wilson's	----	----	----	----	----	----	----	----	----	----	----	----	----	----	38.2	10	----	----
Henry Grady	----	----	----	----	----	----	----	----	----	----	----	----	----	----	38.0	11	----	----
Parker's Cocke's Prolific.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	37.8	12	----	----
Fry's Improved	----	----	----	----	----	----	----	----	----	----	----	----	----	----	35.5	17	----	----
Wyatt's Improved	----	----	----	----	----	----	----	----	----	----	----	----	----	----	35.0	20	----	----
Sharber's	----	----	----	----	----	----	----	----	----	----	----	----	----	----	34.7	22	----	----
Bradbury's Improved.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	31.7	28	----	----
Six-ear Corn	----	----	----	----	----	----	----	----	----	----	----	----	----	----	28.6	31	----	----

TABLE III—SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER OF VARIETIES OF CORN TESTED IN 1907.

EDGECOMBE FARM.

Varieties.	Rank According to the Following Characters.													
	Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.	Earliness as Shown by Date of Silking.	Height of Stalks.	Height of Ears.	Weight of Bushel of Shelled Corn.
Wyatt's Improved	1	1	14	24	5	4	12	24	11	18	4	3	2	12
Cocke's Prolific (Tenn.)	2	2	13	24	9	18	14	22	19	5	7	6	6	1
Weekley's Improved	3	3	6	15	15	20	23	12	11	6	5	9	5	9
Marlboro Prolific (B. P. I.)	4	4	20	20	10	22	8	28	14	8	4	12	12	8
Jarvis' Improved	5	6	1	10	20	3	26	8	5	15	3	4	5	13
Biggs' Seven Ear	6	5	21	27	2	25	3	33	16	1	9	8	8	11
American Queen	7	7	29	21	8	21	5	31	17	2	7	13	11	6
Pool's	8	10	24	2	28	16	9	27	15	11	3	15	17	2
Boone County White (Tenn.)	9	8	23	17	13	6	10	26	8	17	2	12	12	12
Six-ear Corn	9	8	31	17	13	6	4	32	8	3	7	6	3	12
Boone County White (Ind.)	10	11	34	11	19	5	1	35	12	24	3	13	14	7
Hickory King (Va.)	10	16	18	1	29	15	17	19	8	14	3	14	15	4
Cocke's Prolific (Edgecombe)	11	12	7	15	15	19	24	10	18	9	7	7	7	1
Reid's Yellow Dent	12	15	30	7	23	9	7	29	7	25	4	14	15	10
Riley's Favorite	13	14	33	12	18	13	2	34	5	22	3	16	19	14
Williams'	14	9	8	28	1	8	22	13	17	30	6	6	4	12
Hickory King (Tenn.)	15	19	16	4	26	14	19	16	2	16	3	17	14	15
Wilson's Success	16	13	26	25	4	23	13	23	9	7	7	2	3	15
Parker's Cocke's Prolific	17	18	28	26	3	19	11	25	8	7	5	15	13	16
Sanders' Improved	18	24	19	4	26	14	20	15	7	13	7	8	6	9
Sharber's	18	17	17	28	1	8	18	17	17	12	4	14	10	12
Marlboro Prolific	18	20	9	22	7	17	27	7	15	4	5	8	6	8
Southern Beauty	19	22	10	18	12	1	28	11	2	24	5	10	8	19
Fry's Improved	20	23	3	15	15	8	33	2	16	27	8	4	2	5
Farmers' Favorite	20	21	32	23	6	7	6	30	13	19	3	5	9	10
Brakes'	21	28	12	5	25	12	25	9	12	28	5	5	7	5
Holt's Strawberry	22	24	5	16	14	2	31	4	10	29	6	5	4	10
Selection 77	22	25	27	14	16	11	15	21	3	22	3	14	15	18
McMackin's Gourd Seed	22	27	15	9	21	2	23	12	2	25	5	10	7	17

TABLE III—SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER OF VARIETIES OF CORN TESTED IN 1907—CON.

EDGECOMBE FARM.

Varieties.	Rank According to the Following Characters.													
	Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.	Earliness as Shown by Date of Silking.	Height of Stalks.	Height of Ears.	Weight of Bushel of Shelled Corn.
Iowa Silver Mine	23	28	4	8	22	10	32	3	16	26	3	19	20	3
Leaming Yellow	24	26	23	13	17	12	17	18	8	20	1	18	18	11
Boone County Special	25	29	25	18	12	7	16	20	2	23	3	14	16	19
Hastings' Prolific	26	30	7	6	24	24	30	5	14	10	9	5	4	4
Bradbury's Improved	27	32	22	5	25	7	21	14	6	24	8	11	7	10
Henry Grady	28	31	2	19	11	2	34	1	1	21	8	1	1	20
Mosby's Prolific	29	33	11	3	27	16	29	6	4	20	9	10	2	13

TABLE III—SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER OF VARIETIES OF CORN TESTED IN 1907—CON.

IREDELL FARM.

Varieties.	Rank According to the Following Characters.													
	Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.	Earliness as Shown by Date of Silking.	Height of Stalks.	Height of Ears.	Weight of Bushel of Shelled Corn.
Biggs' Seven Ear	1	2	21	8	5	26	5	32	12	2	10	9	3	----
American Queen	2	1	25	9	4	22	2	35	14	7	8	1	4	----
Southern Beauty	3	3	11	6	7	7	16	20	9	16	8	1	5	----
Pool's	4	6	20	2	11	17	18	17	3	12	4	9	4	----
Boone County White (Ind.)	5	8	22	7	6	5	10	27	11	25	3	13	4	----
Cocke's Prolific (Edgecombe)	6	7	7	10	3	24	23	14	17	3	9	3	1	----
Marlboro Prolific	7	5	15	11	2	23	21	15	19	9	8	13	5	----
Selection 77	8	11	19	4	9	12	15	22	5	17	3	8	4	----
Goodman's Prolific	9	17	23	1	12	18	13	24	2	1	9	15	5	----
Jarvis' Improved	10	13	16	4	9	8	22	13	1	27	6	5	4	----
Wilson's Success	10	4	10	10	3	2	19	19	22	4	5	13	3	----
Henry Grady	11	9	2	11	2	4	29	7	19	5	4	4	2	----
Parker's Cocke's Prolific	12	10	31	10	3	20	1	36	18	8	5	7	2	----
Brakes'	13	14	3	7	6	3	30	6	11	30	5	6	3	----
Boone County Special	13	20	26	4	9	8	11	26	6	23	3	8	2	----
Hickory King (Tenn.)	14	19	13	6	7	1	24	12	9	19	3	18	3	----
Weekley's Improved	15	15	9	8	5	16	27	9	12	10	9	9	3	----
Cocke's Prolific (Tenn.)	15	12	6	10	3	18	28	8	13	12	6	5	3	----
Sanders' Improved	16	22	18	4	9	19	20	16	7	9	7	7	1	----
Fry's Improved	17	18	4	9	4	11	31	5	16	18	5	1	1	----
McMackin's Gourd Seed	18	22	14	7	6	11	26	10	11	29	5	16	3	----
Holt's Strawberry	19	21	1	9	4	9	33	3	15	28	5	3	2	----
Wyatt's Improved	20	16	24	11	2	5	12	25	19	6	8	7	3	----
Currituck	21	23	30	7	6	11	4	33	11	24	7	8	3	----
Sharber's	22	24	28	4	9	21	8	29	6	25	5	6	2	----
Boone County White (Tenn.)	23	22	27	9	4	9	9	28	15	21	5	15	3	----
Hickory King (Va.)	24	26	12	4	9	9	17	21	7	14	5	7	3	----
Iowa Silver Mine	25	26	29	7	6	14	6	31	10	22	2	17	5	----
Williams'	26	22	8	12	1	5	20	16	20	26	10	5	2	----
Farmers' Favorite	27	25	23	11	2	3	17	18	19	21	4	7	1	----

TABLE III—SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER OF VARIETIES OF CORN TESTED IN 1907—CON.

IREDELL FARM.

Varieties.	Rank According to the Following Characters.													
	Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.	Earliness as Shown by Date of Silking.	Height of Stalks.	Height of Ears.	Weight of Bushel of Shelled Corn.
Bradbury's Improved	28	28	21	4	9	17	25	11	8	15	8	7	1	----
Leaming Yellow	29	27	32	9	4	15	3	34	15	21	1	14	3	----
Mosby's Prolific	30	29	5	3	10	19	34	2	4	13	8	14	3	----
Six-ear Corn	31	30	17	6	7	27	35	1	3	4	10	9	2	----
Hastings' Prolific	32	30	15	5	7	25	32	4	9	11	10	2	1	----
Reid's Yellow Dent	33	31	32	6	8	10	7	30	9	20	3	12	5	----
Riley's Favorite	34	32	33	7	6	13	14	23	21	21	2	7	1	----

TABLE IV—COMPILED RESULTS OF VARIETY TESTS OF CORN, SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER.

EDGECOMBE FARM.

Varieties.	Number of Years Tested.	Rank According to the Following Characters.												
		Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.[1]	Earliness as Shown by Date of Silking.[1]	Height of Stalks.[2]	Height of Ears.[2]
Holt's Strawberry	5	8	9	3	11	4	2	14	2	10	13	6	2	1
Marlboro Prolific	5	5	4	7	13	2	14	12	4	12	3	4	4	7
Sanders' Improved	5	3	5	8	1	14	10	10	6	1	5	7	6	4
Cocke's Prolific (Edgecombe)	5	1	1	2	13	2	12	7	8	15	2	7	7	5
Brakes'	5	7	10	4	4	11	4	13	3	5	9	6	3	3
Boone County White (Ind.)	5	6	7	13	10	5	1	2	13	11	11	3	11	10
Cocke's Prolific (Tenn.)	5	4	3	6	12	3	11	11	6	14	4	7	1	6
Weekley's Improved	5	2	2	5	9	6	15	9	7	9	1	5	8	8
Iowa Silver Mine	5	11	14	10	3	12	8	12	5	7	10	3	15	14
Leaming Yellow	5	10	13	12	5	10	7	5	10	3	11	1	14	13
Selection 77	5	6	8	11	7	8	5	4	11	4	12	3	10	9
Boone County White (Tenn.)	5	7	6	9	14	1	3	6	9	13	8	2	9	10
Reid's Yellow Dent	5	10	12	14	6	9	6	3	12	6	7	4	12	11
Mosby's Prolific	5	12	15	1	2	13	13	15	1	2	6	8	5	2
Riley's Favorite	5	9	11	15	8	7	9	1	14	8	8	3	13	12

[1]Results in these columns are from data of 1907 only.

[2]Results in these columns are from data of 1905, 1906 and 1907.

TABLE IV—COMPILED RESULTS OF VARIETY TESTS OF CORN, SHOWING RELATIVE EARLINESS, YIELDS, SIZE OF EARS, HEIGHT OF STALKS AND EARS, AND PERCENTAGE OF GRAIN, COB, EARS AND STOVER—CON.

IREDELL FARM.

Varieties.	Number of Years Tested.	Rank According to the Following Characters.												
		Yield of Shelled Corn in Bushels per Acre.	Yield of Ear Corn in Pounds per Acre.	Yield of Stover in Pounds per Acre.	Percentage of Grain.	Percentage of Cob.	Largeness of Ears.	Percentage of Ears.	Percentage of Stover.	Smallness in Lbs. of Ear Corn Required to Shell Bushel of Corn.	Prolificacy of Ears per Stalk.	Earliness as Shown by Date of Silking.	Height of Stalks.	Height of Ears.[1]
Cocke's Prolific (Tenn.)	5	3	2	4	10	2	11	9	4	11	3	6	2	4
Weekley's Improved	5	1	1	2	9	3	10	10	3	8	1	8	3	3
Mosby's Prolific	5	10	12	3	3	10	9	11	2	3	4	8	5	2
Boone County White (Tenn.)	5	5	4	6	9	4	4	6	7	7	9	4	8	5
Holt's Strawberry	5	6	6	1	11	1	1	12	1	9	11	7	1	1
Riley's Favorite	5	11	10	12	7	6	6	1	12	10	8	5	10	12
Sanders' Improved	5	3	7	5	1	12	8	8	5	1	2	7	4	8
Selection 77	5	4	5	9	5	8	4	4	9	5	5	3	6	6
Reid's Yellow Dent	5	9	11	8	2	11	3	7	6	2	6	3	9	9
Leaming Yellow	5	7	8	10	4	9	7	3	10	4	7	2	11	10
Iowa Silver Mine	5	8	9	11	6	7	5	2	11	6	8	1	12	11
Boone County White (Ind.)	5	2	3	7	8	5	2	5	8	7	10	4	7	7

[1]Results in this column are from data of 1904, 1905, 1906 and 1907.

COMMENTS ON VARIETY TESTS OF CORN.

The variety tests were conducted this year at the Edgecombe and Iredell farms. The land at the Edgecombe farm devoted to this test was good general farm land, while at Iredell a fine brownish clay soil with a red clay subsoil was used. To eliminate all inequalities in the character of the land, if any, the designated varieties at the different farms were planted each in separate rows, arranged consecutively, and this plan was repeated from two to four times, varying with the length of the rows, in order to give the desired acreage to each variety. The varieties are arranged in Table I in the order of their productivity of shelled corn per acre; also the rank of stover per acre is indicated in the second column. In Table II are brought together the results of varietal tests obtained at the Edgecombe farm during 1900, 1901, 1902, 1903, 1904, 1905, 1906 and 1907; at Red Springs in 1900 and 1901, and at Iredell during 1903, 1904, 1905, 1906 and 1907. Results from the testing of varieties of corn were obtained at the Transylvania farm during 1906 only. The vigorousness in growth, prolificacy, largeness of ears, percentages of grain and stover, yields, etc., of all varieties tested at the different farms are shown in Tables I, II, III and IV.

By consulting Table II it will be seen that the differences in yield of shelled corn per acre on the different farms during the period covered by the tests between the variety yielding the highest and the one the lowest in the individual tests have ranged all the way from 6.2 to 26.6 bushels of shelled corn at the Edgecombe farm during the past eight years, with the number of varieties in the different tests varying from eight to thirty-six; from 7.7 to 14 bushels at Red Springs, when using nine varieties for each of two years; from 12.1 to 13.5 bushels during five years at Iredell, where from nineteen to thirty-seven varieties were employed; and a difference of 24.8 bushels at Transylvania during 1906, where thirty-four varieties were planted.

Tables III and IV will be found to contain much valuable data, in plain, compact form, relative to the different characters of corn when grown under widely varying soil and climatic conditions. A careful study of these tables should be made by every corn-growing reader.

Table II also gives the average standing of all the varieties, at each farm, that have been tested continuously since the beginning of the work in the different localities. The varieties which have averaged the highest yields of shelled corn at the different farms are: At Edgecombe, during eight years, Cocke's Prolific, Weekley's Improved, Sanders' Improved and Holt's Strawberry; at Red Springs, during two years, Native, Cocke's Prolific, Holt's Strawberry and Weekley's Improved; at Iredell, Weekley's Improved, Sanders' Improved, Cocke's Prolific and Boone County White.

NOTES ON VARIETIES OF CORN TESTED IN 1907.[1]

Cocke's Prolific, from Edgecombe-grown seed, ranked second in 1900, 1901 and 1904, first in 1902, 1903, 1905 and 1906, and eleventh in 1907, at the Edgecombe farm; at Red Springs it stood fifth in 1900 and third in 1901; at Iredell, from Edgecombe-grown seed, sixth in 1904, first in 1905, seventh in 1906, and sixth in 1907; at Transylvania, second in 1906. The yield from Tennessee-grown seed of this variety at Edgecombe was seventh in 1903, twelfth in 1904, fourteenth in 1905, ninth in 1906, and second in 1907; fourteenth in 1904, tenth

[1]The basis of rank in these notes is according to the yield of bushels of shelled corn per acre.

in 1905, twenty-first in 1906, and fifteenth in 1907 at Iredell; twenty-eighth in 1906 at Transylvania. From Experiment Station-grown seed, originally from Edgecombe farm, Cocke's Prolific ranked twenty-fourth in 1906 at Transylvania. The results of comparative varietal tests conducted during the past eight years on the test farms indicate this to be a most substantial and reliable variety; in fact, one of the best varieties thus far tested for growth on the sandy loam soils of the eastern portion of the State. One defect, however, with this variety is that the grains are too short.

Weekley's Improved is a very good variety, having ranked first and second at the Iredell and Edgecombe farms as an average of four and seven years' trials, respectively. It is fairly early in maturity, and can be grown with more safety than most of the other varieties when only a short growing season is afforded. At the Edgecombe farm it ranked in 1900 third, in 1901 first, in 1902, 1905 and 1906 second, but in 1903 and 1904 it fell down to tenth and thirteenth places, respectively, and in 1907 ranked third. In 1901 it was first at Red Springs; in 1903 sixth, in 1904 tenth, in 1905 second, in 1906 first, and in 1907 fifteenth at Iredell; and in 1906 fifth at Transylvania. This variety has a little smaller ear and cob than Cocke's Prolific.

Sanders' Improved, from Georgia-grown seed, ranked fourth in 1900, third in 1901, fourth in 1902 and in 1906, seventeenth in 1903, third in 1904, fourth in 1905, and eighteenth in 1907 at the Edgecombe farm; sixth in 1901 at Red Springs; and tenth in 1903, ninth in 1904, thirteenth in 1905, fifteenth in 1906, and sixteenth in 1907 at Iredell; and third in 1906 at Transylvania. This variety produces an ear about the size of Cocke's Prolific, but contains a smaller cob by about three to six per cent, and consequently requires about three to five pounds less of corn on the ear, as shown by an average of the results of the past eight years, to shell a bushel of corn.

Holt's Strawberry occupied first place in 1900, sixth in 1901, 1902 and 1906, fifteenth in 1903, twenty-fifth in 1904, seventh in 1905, and twenty-second in 1907 at the Edgecombe farm; ninth in 1900 and second in 1901 at Red Springs; eighth in 1903, sixteenth in 1904, nineteenth in 1905 and 1907, and twenty-fourth in 1906 at Iredell; and second in 1906 at Transylvania. It has a much larger ear than Cocke's Prolific, and produces a large percentage of stover.

Brakes', as the result of the tests in Edgecombe, the home of the variety, ranked eleventh in 1902, nineteenth in 1903, seventh in 1904, thirteenth in 1905 and 1906, and twenty-first in 1907. At Iredell it occupied first place in the tests of 1904, seventh in 1905, fifth in 1906, and thirteenth in 1907; and twentieth at Transylvania in 1906. This variety has a short, large ear.

Leaming Yellow ranked twelfth in 1902, fourth in 1903, fifteenth in 1904, twenty-first in 1905, twenty-ninth in 1906, and twenty-fourth in 1907 at the Edgecombe farm; and twelfth in 1903, fourteenth in 1904, twenty-first in 1905 and 1906, and twenty-ninth in 1907 at Iredell; and thirty-second at Transylvania in 1906. This is a yellow corn that has a strong tendency to produce only one large ear per stalk. It has yielded excellent results in Indiana, Iowa and Illinois in comparison with other varieties.

Selection 77, from Ohio-grown seed, ranked fifth, sixteenth, eighth, twentieth and twenty-second at Edgecombe, and eleventh, twelfth, twenty-fifth, sixteenth and eighth at Iredell in 1903, 1904, 1905, 1906 and 1907, respectively; and twenty-fifth in 1906 at Transylvania. This corn has a larger ear and a slightly greater percentage of shelling capacity than Cocke's Prolific.

Riley's Favorite, from Indiana-grown seed, ranked ninth, eighteenth, twen-

ty-fifth and thirteenth at the Edgecombe farm; eighth, twenty-second, twenty-seventh, twelfth and thirty-fourth at Iredell in 1903, 1904, 1905, 1906 and 1907, respectively; and twenty-ninth in 1906 at Transylvania. This is a yellow corn, with fairly small and narrow grains. It has a somewhat larger ear than Cocke's Prolific. This is an early maturing variety.

Boone County White, from Indiana-grown seed, stood in 1903, 1904, 1906 and 1907 eleventh, twenty-third, eighteenth and tenth at Edgecombe, and fifteenth in 1903, eighth in 1904, fourteenth in 1905, nineteenth in 1906 and fifth in 1907 at Iredell, and eighteenth in 1906 at Transylvania; while from Tennessee-grown seed it ranked thirteenth, seventeenth, ninth, twenty-eighth and ninth at Edgecombe in 1903, 1904, 1905, 1906 and 1907; seventh in 1904, thirteenth in 1905, fourteenth in 1906 and twenty-third in 1907 at Iredell; and twenty-third in 1906 at Transylvania. This is a large, white-eared variety.

Reid's Yellow Dent, from Illinois-grown seed, ranked twelfth in 1903, eighteenth in 1904, twenty-third in 1905, twenty-fourth in 1906 and twelfth in 1907 at Edgecombe; twelfth in 1903, nineteenth in 1904, twentieth in 1905, twenty-second in 1906 and thirty-third in 1907 at Iredell; and thirty-third in 1906 at Transylvania. This is a yellow variety of corn that has done well in the Northwestern States, but has a strong tendency, when grown under Southern conditions, as indicated by our variety tests, to produce only one large ear per stalk and smaller yields per acre than the two-eared varieties. It is medium early in maturity.

Marlboro Prolific, from South Carolina-grown seed, from Bureau of Plant Industry, ranked thirteenth in 1903, second in 1904, eleventh in 1905, eighth in 1906 and eighteenth in 1907 at the Edgecombe farm; third in 1903, twelfth in 1905, sixth in 1906 and seventh in 1907 at Iredell; and seventh in 1906 at Transylvania. From South Carolina-grown seed, from Excelsior Seed Farm, Marlboro Prolific ranked fourth in 1907 at the Edgecombe farm. This variety has an ear a little larger in size than Cocke's Prolific, and has a decidedly strong tendency to bear more than one ear to each stalk.

Iowa Silver Mine, from Illinois seed, ranked fourteenth at both Edgecombe and Iredell farms in both 1903 and 1904, twenty-fourth at both in 1905, twenty-first in 1906, and twenty-third in 1907 at Edgecombe, and twenty-sixth in 1906, twenty-fifth in 1907 at Iredell; and thirty-first in 1906 at Transylvania. This is a white, large-eared corn that has a smaller percentage of cob to grain than Cocke's Prolific. Its grains are well shaped, showing the effect of prolonged and intelligent breeding and selection. This is one of the earliest varieties which the Department has tested.

Mosby's Prolific, from Mississippi-grown seed, ranked fifth in 1900, twelfth in 1903, eighteenth in 1904, twenty-second in 1905, seventeenth in 1906 and twenty-ninth in 1907 at Edgecombe; third in 1900 at Red Springs; seventh in 1903, eighteenth in 1904, thirty-first in 1905, twenty-sixth in 1906 and thirteenth in 1907 at Iredell; and twenty-seventh in 1906 at Transylvania. It has a large proportion of stalk to ear, as it has a large stalk.

Williams' ranked in 1904 fourth and fifteenth, in 1905 twenty-first and fifth, in 1906 twelfth and fourth, and in 1907 fourteenth and twenty-sixth at Edgecombe and Iredell, respectively; and thirteenth in 1906 at Transylvania. This variety has a large, tall stalk and large ears that contain a medium high percentage of cob, especially when grown at Iredell. It seems better suited to bottom than upland.

Boone County Special stood ninth and sixteenth in 1904, sixteenth and fif-

teenth in 1905, twenty-seventh and twenty-seventh in 1906, and twenty-fifth and thirteenth in 1907, respectively, at the Edgecombe and Iredell farms; and thirteenth in 1906 at Transylvania. The ears are rather below the medium in size.

McMackin's Gourd Seed ranked nineteenth, fifteenth, fifth and twenty-second at Edgecombe; twentieth, twenty-eighth, twenty-fifth and eighteenth at Iredell in 1904, 1905, 1906 and 1907, respectively, and eighth in 1906 at Transylvania. Medium in date of maturity.

Currituck, which is grown rather extensively in some sections of the Piedmont Plateau of North Carolina, ranked twenty-second in 1904, eleventh in 1905 and twenty-second in 1906 at Edgecombe; twenty-third in 1904, eleventh in 1905, eighteenth in 1906 and twenty-first in 1907 at Iredell; and seventeenth in 1906 at Transylvania. Its ears are large and contain a medium high percentage of cob to grain.

Shellem's Prolific ranked at Iredell seventeenth in 1904, tenth in 1905 and twelfth in 1906; at Edgecombe, nineteenth in 1905 and fourteenth in 1906; and fifteenth at Transylvania in 1906. It has a small ear and is early when grown in western North Carolina.

Eureka ranked twelfth in 1905 and seventh in 1906 at Edgecombe; twenty-sixth in 1905 and twenty-third in 1906 at Iredell; and fourth in 1906 at Transylvania. This variety has a white ear, with a comparatively high percentage of cob to grain.

Hickory King, from Tennessee-grown seed, ranked ninth in 1901, sixth in 1903 and 1905, eleventh in 1906 and fifteenth in 1907 at Edgecombe; thirteenth in 1903, sixth in 1905, eighth in 1906 and fourteenth in 1907 at Iredell; eighth in 1901 at Red Springs; and first in 1906 at Transylvania. From Virginia-grown seed it stood tenth in 1905, twenty-sixth in 1906 and tenth in 1907 at Edgecombe; eleventh in 1905 and twenty-fourth in 1907 at Iredell; and twenty-first in 1906 at Transylvania. This is a prolific variety, with small ears and broad and shallow grains.

Thomas' Improved ranked fourteenth in 1904, fourth in 1905 and eleventh in 1906 at Iredell; third in 1905 and thirteenth in 1906 at Edgecombe; and fourteenth in 1906 at Transylvania. This is a vigorous, rank-growing variety that matures rather late.

Peele's Prolific stood eighteenth in 1905 and nineteenth in 1906 at Edgecombe; seventeenth in 1905 and 1906 at Iredell; and ninth in 1906 at Transylvania.

American Queen occupied third place in 1905, second in 1906 and second in 1907 at Iredell; tenth in 1906 and seventh in 1907 at Edgecombe; and twelfth in 1906 at Transylvania.

Square Deal, in 1904 and 1905, ranked sixth and seventh at Edgecombe, and twenty-first and twenty-third at Iredell.

Hastings' Prolific ranked fifteenth in 1906 and twenty-sixth in 1907 at Edgecombe; twenty-first in 1906 and thirty-second in 1907 at Iredell; and twenty-second in 1906 at Transylvania.

Southern Beauty ranked sixteenth in 1906 and nineteenth in 1907 at Edgecombe; thirteenth in 1906 and third in 1907 at Iredell; and sixth in 1906 at Transylvania.

Farmers' Favorite ranked twenty-second in 1906 and twentieth in 1907 at Edgecombe; third in 1906 and twenty-seventh in 1907 at Iredell; and sixteenth in 1906 at Transylvania.

Biggs' Seven Ear ranked third in 1903, first in 1904, third in 1906 and sixth in 1907 at Edgecombe; first in 1903, second in 1904, ninth in 1906 and first in 1907 at Iredell; and tenth in 1906 at Transylvania.

Wilson's Success ranked twenty-third in 1906 and sixteenth in 1907 at Edgecombe, and tenth in 1907 at Iredell.

Battle's Prolific stood twenty-fifth in 1906 at Edgecombe, and tenth in 1906 at Iredell, and eleventh in 1906 at Transylvania.

Hamilton (native) ranked twenty-sixth in 1906 at Transylvania.

Merrill (native) ranked nineteenth in 1906 at Transylvania.

Jarvis' Improved ranked this year fifth at Edgecombe and tenth at Iredell.

Wyatt's Improved ranked first at Edgecombe this year, and twentieth at Iredell.

Pool's, from Georgia-grown seed, ranked eighth this year at Edgecombe, and fourth at Iredell.

Six-ear Corn ranked ninth this year at Edgecombe, and thirty-first at Iredell.

Parker's Cocke's Prolific ranked seventeenth this year at Edgecombe, and twelfth at Iredell.

Sharber's ranked eighteenth this year at Edgecombe, and twenty-second at Iredell.

Fry's Improved ranked twentieth this year at Edgecombe, and seventeenth at Iredell.

Bradbury's Improved ranked twenty-seventh this year at Edgecombe, and twenty-eighth at Iredell.

Henry Grady ranked twenty-eighth this year at Edgecombe, and eleventh at Iredell.

Goodman's Prolific ranked ninth this year at Iredell.

STUDY OF COMPILED RESULTS OF VARIETY TESTS OF CORN.

During the past eight years on the test farms of the Department something over fifty varieties of corn have been studied in comparative field tests. The number of varieties in the different tests has ranged all the way from eight in 1900 to thirty-seven in 1907. The different tests of varieties at the several farms were grown as nearly under the same conditions of soil, fertilization and cultivation as it was possible to provide. To eliminate all inequalities in the character of the land, if any, the varieties at the different farms were planted each in separate rows, arranged consecutively, and this plan was repeated from three to four times, varying with the length of the rows, in order to give the desired acreage to each variety. By taking these precautions the results obtained should be reliable and highly valuable.

WHAT IS A VARIETY?

A variety is supposed to represent in a general way a class of plants with one or more distinguishing characteristics, but with a cereal like corn, which crosses so readily, variety does not signify much unless proper precautions have been exercised in its growth.

Take some variety of corn, say Cocke's Prolific, that has been bred carefully and intelligently through a number of years for high yield of shelled corn per stalk, and grow it continuously in or adjacent to a field of inferior corn, and in a very short time, especially if proper seed selection is not practiced, it will give much smaller yields, when grown under the same conditions, than the

original pure-bred corn; this being due to the fact that you no longer have pure Cocke's Prolific, but a mixture of "scrub" and Cocke's Prolific corn. This fact emphasizes the importance of securing seed from reliable parties.

EARLY MATURING VARIETIES.

Iowa Silver Mine, Riley's Favorite, Leaming Yellow, Reid's Yellow Dent, Boone County Special and Boone County White are six of the earliest varieties in maturing that have thus far been tested on the farms of the Department. These were all originated in the Northern-central States, where they have been accustomed to a comparatively short growing season, which accounts largely for their inherent tendency to early maturity when grown under North Carolina conditions. Earliness, however, we do not consider an important requisite with corn for this climate, except, possibly, where corn is grown in the mountainous section of the State, or where corn, of necessity, has to be planted late, after the maturity of some crop like Irish potatoes or other truck crop. Under these circumstances it may be well to use one of the varieties mentioned above, especially if experience has taught the farmer that local varieties do not thoroughly mature before frost.

MEDIUM MATURING VARIETIES.

Biggs' Prolific, Craig's Prolific White, Cocke's Prolific and Craig's Prolific Strawberry mature at a medium date in the fall, and some of these are our most prolific varieties. All these will mature on the different types of soil of the State if planted before July 1.

LATE MATURING VARIETIES.

It has been found that Holt's Strawberry, Marlboro Prolific, Sanders' Improved, Weekley's Improved and Mosby's Prolific are the latest maturing varieties tested during the past five years. These varieties generally produce a large and tall stalk when grown under conditions as represented by the Iredell farm, *i. e.*, the results of the past five years' tests at that place indicate as much.

VARIETIES ADAPTED TO THE EAST SECTION.

A study of the results of the variety tests conducted at the Edgecombe farm during the past seven years indicates that the varieties of corn best suited to the fine loamy soils of the eastern and southwestern parts of the State are Cocke's Prolific, Biggs' Seven Ear, Weekley's Improved, Marlboro Prolific, Craig's Prolific Strawberry, Sanders' Improved and Holt's Strawberry, in about the order in which they are arranged. Cocke's Prolific and Biggs' Seven Ear have proven exceedingly promising varieties. All these varieties, except Holt's Strawberry and Craig's Prolific Strawberry, are white and prolific, and produce medium to small ears.

VARIETIES ADAPTED TO PIEDMONT AND MOUNTAIN SECTIONS.

It has been found from a testing of thirty-eight varieties during the past five years at the Iredell farm, located in the Piedmont section, that Weekley's Improved, Biggs' Seven Ear, Craig's Prolific White, Cocke's Prolific, Sanders' Improved, Hickory King, Holt's Strawberry, Boone County White, Leaming Yellow and Reid's Yellow Dent are the largest yielders of shelled corn per

acre of all the varieties thus far tested. These, too, are all white varieties and are medium to medium late in maturity. The best of the varieties tested at the western farm are almost the same as for the east, but the order of prolificacy is somewhat different.

CORRELATION OF CHARACTERS OF VARIETIES OF CORN.

One of the purposes of our detailed study of varieties of corn, exhibited in Tables I, II, III and IV, is to ascertain what characters, being mutually helpful and hence conducive of greater yields, may be expected to be found combined in the same variety, and what ones, being generally antagonistic, seldom or never occur in the same plant or group of plants. This knowledge is of the most fundamental importance in the proper production of not only corn, but all other agricultural crops, as one being familiar with these facts will be better enabled to originate, improve or select varieties best adapted to different localities, soils and purposes. It is also felt that a more correct interpretation can be placed on the results obtained in variety tests.

In Table IV are brought together the average results of the work of five years (1903-'04-'05-'06-'07) at the Edgecombe and Iredell farms, separately. From a detailed study of this table, supplemented by field observations, the following tentative inductions are made with reference to varieties of corn studied when they are grown under conditions of soil and climate as represented by these two farms:

Antagonistic Characters.—(1) Earliness in maturity, other things being equal, is not generally conducive to large yields of grain and stover. (2) Large-eared varieties usually have a low percentage of grain to cob, and are as a rule less productive of shelled corn per acre. (3) Ears with very small cob have poorly shaped kernels, and give a small amount of shelled corn per ear, and *vice versa*. (4) Kernels of low vitality do not tend to the growth of plants of maximum yields.

Associated Characters.—(1) Earliness, other things being equal, usually tends to high percentage of ear to stover, and *vice versa*, although this ratio is more or less modified by season, soil, fertilization and breeding. (2) Varieties producing two ears per stalk are generally more productive of shelled corn per acre than those bearing only one ear, although it may be a large one. (3) Medium maturity, other things being equal, tends to increase yields per acre of grain. (4) Small kernels usually possess low vitality. (5) Kernels with small germs (chits) contain a small percentage of oil or fat. (6) Varieties with good root and leaf development are usually the most resistant ones to drought and disease and insect ravages.

SELECTING SEED FOR IMPROVEMENT.

In the improvement of corn by seed selection an endeavor should be made to start with the best variety as ascertained by actual tests in the field through a sufficient number of years to eliminate weather conditions. It must be borne in mind that in all plant improvement the same principles and practices that have been employed with such striking results in the improvement of the different breeds of animals must be followed.

For corn there are three general methods of improvement: First, by importation of seed from some reputable breeder or grower; second, by the careful

selection of seed corn from one's own field or from a neighbor's; third, by careful selection and growing of seed corn in a field isolated something like four or five hundred yards from any other corn field.

The characters that should be taken into account in the improvement of corn by selection are:

(1) Selection of ears from stalk bearing two or more ears, as it has been demonstrated time and again that a variety that bears two medium-sized ears per stalk will generally give higher yields of shelled corn per acre than a variety bearing one large ear to the stalk.

(2) The stalk should be large at the base and tapering gradually towards the tassel, for two reasons—first, because it will be better enabled to withstand drought, and, second, because it will stand up better in windstorms.

(3) The ears should by all means be of a cylindrical form, with both butts and tips filled out, as this is the form that gives the highest percentage of yield of shelled corn per ear, other things being equal.

(4) The best-shaped kernel is a medium wedge, as this fills out the space on the cob most completely. Also, the distance between the rows of grains should be small, while the number of rows should be large and run parallel the full length of the cob, with little or no diminution in size, either at the butts or tips. The percentage of grains should be from 80 to 90 and should be held rigidly by the cob. It should also possess a high (90 to 95 per cent) germinating power, and great resisting power to disease and insect ravages.

It should be kept clearly in mind that, with varieties of corn, selection should be made particularly with reference to total yield of shelled corn and the characters which tend to give this and an improved quality of grains. If it is to be used in feeding growing animals, or to be ground into meal for human consumption, it should be high in flesh and muscle-forming material (protein); if for fattening stock, high in fat, and if to manufacture whiskey, alcohol or starch, high in starch, sugar, etc. (carbohydrates).

SOURCES OF VARIETIES OF CORN TESTED.

The seed used in the variety tests of corn at the Edgecombe and Iredell farms this year were obtained from the following sources:

American Queen.....R. P. Dalton, Winston, N. C.
Boone County Special (Illinois)..Bureau of Plant Industry, Washington, D. C.
Boone County White (Tennessee), Bureau of Plant Industry, Washington, D. C.
Boone County White (Indiana)...Bureau of Plant Industry, Washington, D. C.
Brake's.....Joe L. Brake, Rocky Mount, N. C.
Bradbury's Improved.....J. E. Bradbury, Jr., Athens, Ga.
Biggs' Seven Ear.....Noah Biggs, Scotland Neck, N. C.
Cocke's Prolific.....Edgecombe Test Farm, Rocky Mount, N. C.
Cocke's Prolific (Tennessee).....Bureau of Plant Industry, Washington, D. C.
Currituck.....T. L. Jarvis, Moyock, N. C.
Farmers' Favorite.....A. Cannon, Horse Shoe, N. C.
Fry's Improved.....H. C. Fry, Clarksville, Ga.
Goodman's Prolific.....J. K. Goodman, Mount Ulla, N. C.
Hastings' Prolific.....H. G. Hastings & Co., Atlanta, Ga.
Hickory King (Virginia).....A. O. Lee, Hickory, Va.
Hickory King (Tennessee).....Bureau of Plant Industry, Washington, D. C.
Holt's Strawberry.....T. W. Wood & Sons, Richmond, Va.
Henry Grady.....W. G. Headden, Austell, Ga.
Iowa Silver Mine (Illinois).....Bureau of Plant Industry, Washington, D. C.
Jarvis' Improved.....T. L. Jarvis, Moyock, N. C.

Leaming Yellow (Ohio).....Bureau of Plant Industry, Washington, D. C.
Marlboro Prolific (S. Carolina)..Bureau of Plant Industry, Washington, D. C.
Marlboro Prolific.....Excelsior Seed Farm, Cheraw, S. C.
McMackin's Gourd Seed (Tenn.)..Bureau of Plant Industry, Washington, D. C.
Mosby's Prolific (Miss.).....Bureau of Plant Industry, Washington, D. C.
Parker's Cocke's Prolific.....T. B. Parker, Raleigh, N. C.
Pool's.....J. C. Pool, Marion, N. C.
Reid's Yellow Dent (Illinois)....Bureau of Plant Industry, Washington, D. C.
Riley's Favorite (Indiana).....Bureau of Plant Industry, Washington, D. C.
Sanders' Improved (Georgia)....Bureau of Plant Industry, Washington, D. C.
Selection 77 (Ohio).....Bureau of Plant Industry, Washington, D. C.
Sharber's.....M. D. Dozier, Camden, N. C.
Six-ear Corn.....Alexander Seed Co., Augusta, Ga.
Southern Beauty.....L. A. Strupe, Tobaccoville, N. C.
Weekley's Improved.....Iredell Test Farm, Statesville, N. C.
Williams'.....C. S. Williams, Franklinton, N. C.
Wilson's Success.....F. D. Wilson, Chase City, Va.
Wyatt's Improved.....Job P. Wyatt, Raleigh, N. C.

RESULTS OF VARIETY-DISTANCE TESTS OF CORN.

The results of these tests are included in the following tables:

TABLE V—RESULTS OF TESTS OF THREE LEADING VARIETIES OF CORN AT DIFFERENT SPACING IN THE ROWS IN 1907.

EDGECOMBE FARM.

Varieties.	Yield, Height of Stalks and Ears at Different Spacing of Stalks in Four-foot Rows.														
	20 Inches.			24 Inches.			30 Inches.			36 Inches.			40 Inches.		
	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.
Cocke's Prolific	112	49	24.1	107	47	23.3	105	44	19.1	104	44	16.8	99	43	16.7
Holt's Strawberry	112	53	23.9	111	52	17.1	112	53	17.3	107	50	15.3	107	49	14.4
Weekley's Improved	107	51	22.1	101	42	15.7	104	47	19.9	101	45	17.9	105	49	12.8

TABLE V—RESULTS OF TESTS OF THREE LEADING VARIETIES OF CORN AT DIFFERENT SPACING IN THE ROWS IN 1907—CON.

IREDELL FARM.

Varieties.	Yield, Height of Stalks and Ears at Different Spacing of Stalks in Four-foot Rows.														
	20 Inches.			24 Inches.			30 Inches.			36 Inches.			40 Inches.		
	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.
Cocke's Prolific	108	60	33.3	100	48	32.5	106	66	35.7	96	54	37.7	106	48	36.8
Holt's Strawberry	108	60	23.4	108	60	27.5	104	54	27.8	96	54	33.0	120	64	29.4
Weekley's Improved	108	60	27.8	106	60	21.1	120	60	38.2	104	60	36.1	124	72	28.4

TABLE VI—COMPILED RESULTS OF THREE YEARS' TESTS OF THREE LEADING VARIETIES OF CORN AT DIFFERENT SPACING IN THE ROWS.[1]

EDGECOMBE FARM.

Varieties.	Yield, Height of Stalks and Ears at Different Spacing of Stalks in Four-foot Rows.														
	20 Inches.			24 Inches.			30 Inches.			36 Inches.			40 Inches.		
	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.	Height of Stalks in Inches at Maturity.	Height of Ears in Inches at Maturity.	Yield in Bushels of Shelled Corn per Acre.
Cocke's Prolific	116.0	55.2	25.7	111.0	56.0	29.4	115.4	55.9	28.7	113.4	53.9	21.9	112.2	50.7	23.4
Holt's Strawberry	119.2	58.4	20.8	120.6	58.0	20.3	121.6	59.9	19.8	118.3	56.9	19.3	118.0	58.0	20.0
Weekley's Improved	107.4	52.0	25.3	110.9	52.5	24.2	113.4	55.9	29.3	113.0	55.7	28.3	112.0	53.9	23.7

IREDELL FARM.

Cocke's Prolific	115.0	57.0	39.1	117.3	56.0	33.7	115.3	58.0	38.0	115.0	55.0	36.9	116.3	52.0	35.2
Holt's Strawberry	121.0	64.0	28.8	119.0	64.0	29.6	116.6	61.0	32.4	111.0	62.0	30.7	120.0	63.3	30.2
Weekley's Improved	122.0	63.0	31.4	119.0	61.0	30.1	127.0	62.0	38.0	116.6	57.0	35.3	121.0	62.0	30.6

[1]Results in this table for the Edgecombe farm were obtained from data of 1905 and 1907.

These tests were conducted at both the Edgecombe and Iredell farms this year. The land devoted to this test at the Edgecombe farm was good general farm land, while that at the Iredell farm was a deep, red, rather open, clay soil, underlain by a tenacious red clay subsoil. Both soil and subsoil contain some rock fragments. The tests were planned and put out in 1905, and continued this year to ascertain if the claim made by some that if distance is given the large one-eared varieties they will produce larger yields of shelled corn per acre than those producing or tending to produce two small or medium-sized ears per stalk. For the test, as seen above, two well-known prolific varieties—Cocke's Prolific and Weekley's Improved—are being compared with Holt's Strawberry, one of the best one-eared varieties. It will be noted that both Cocke's Prolific and Weekley's Improved have each, as an average of three years' results at Iredell and two years' results at Edgecombe, made larger yields than Holt's Strawberry, at both farms, and at all the different distancing of the hills in the rows that were tried.

At the Edgecombe farm, as an average of the results of 1905 and 1907, Cocke's Prolific produced the following increase of bushels of shelled corn over Holt's Strawberry: At 20 inches, 4.9; at 24 inches, 9.1; at 30 inches, 8.9; at 36 inches, 2.6; at 40 inches, 3.4 bushels; while at Iredell the increased yields of Cocke's Prolific over Holt's Strawberry, as an average of the results for 1905, 1906 and 1907, were: At 20 inches, 10.3; at 24 inches, 4.1; at 30 inches, 5.6; at 36 inches, 6.2; at 40 inches, 5.0 bushels.

Weekley's Improved increased yields over Holt's Strawberry, as an average for 1905 and 1907 at the Edgecombe farm, were: At 20 inches, 4.5; at 24 inches, 3.9; at 30 inches, 9.5; at 36 inches, 9.0; at 40 inches, 3.7 bushels; while at the Iredell farm, as an average of three years' tests, 1905, 1906, 1907, the increases of Weekley's Improved over Holt's Strawberry were: At 20 inches, 2.6; at 24 inches, 0.5; at 30 inches, 5.6; at 36 inches, 4.6; at 40 inches, 0.4 bushels.

In the light of these results, coupled with six years' variety tests, it is evident that the largest yields of shelled corn per acre on any type of soil are going to result generally from the use of more prolific varieties, because they will produce more shelled corn per stalk, and, as the stalks are generally smaller and can be planted closer in the row, will contain more stalks per acre.

When the corn is planted wide apart in the row, and in wide-apart rows—matters not if the best one-eared varieties are used—the land will not "turn out" the maximum yield which it is capable of producing, for the reason that there are not enough stalks per acre.

In 1905 Cocke's Prolific and Weekley's Improved, at both the Edgecombe and Iredell farms, produced their largest yields in these tests at the distancing centering about 30 to 36 inches, while Holt's Strawberry did best at the greatest distancing. At the most favorable distancing (40 inches) Holt's Strawberry at the Edgecombe and Iredell farms yielded less by 12.6 and 4.2 bushels of shelled corn per acre, respectively, than Cocke's Prolific at the distancing best suited to it, which was 30 and 36 inches, respectively. Weekley's Improved, with its best distancing at Edgecombe, yielded 13 bushels more than Holt's Strawberry at 40-inch distancing; while at Iredell Weekley's Improved, with the stalks 36 inches in the row, produced 4.2 bushels more per acre than Holt's Strawberry at its optimum distancing (40 inches) in the row.

In 1906, being a year in which excessive amounts of rain fell during the growing period, all three varieties produced largest yields at a distancing of 20 inches in the row; while the next best yields for all were at 30 inches in the row. This year seemed to be especially favorable to the production of maximum yields of all the large one-eared varieties, and at the Iredell farm Holt's Strawberry outyielded Weekley's Improved at both 20 and 30 inches between the hills in four-foot rows.

In 1907, at the Edgecombe farm, all three varieties attained their highest yields at a distancing of 20 inches in the row. At this distancing Cocke's Prolific slightly exceeded Holt's Strawberry, and Holt's Strawberry exceeded Weekley's Improved by 1.8 bushels shelled corn per acre. At the Iredell farm all three varieties made the best yields at a distancing of 36 inches in the row. At this distancing Cocke's Prolific exceeded Holt's Strawberry by 4.7, and Weekley's Improved exceeded Holt's Strawberry by 3.1 bushels shelled corn per acre.

DISTANCE TESTS OF CORN.

The results of the distance tests of corn are brought together in Tables VII and VIII, which follow:

TABLE VII—COMPILED RESULTS OF DISTANCE TESTS OF CORN.

EDGECOMBE FARM.

Rank According to Yield of Shelled Corn per Acre.	Distance Between Stalks.	Distance Between Stalks in Row.	No. Stalks per Plat.		Number Ears per Plat.	Average Height of Stalks in Inches at Maturity.	Yield per Plat in Pounds.				Total Bushels Shelled Corn per Acre.	Pounds Shelled Corn per Stalk.	Stover per Acre—Pounds.
			For Perfect Stand.	By Actual Count.			Large Ears.	Nubbins.	Total Corn on Cob.	Stover.			
7	Three and one-half feet.	Four feet	250	248	365	106.0	112.75	10.25	123.00	92.00	19.6	.41	1140
2	Three and one-half feet.	Three feet	333	364	410	108.0	149.25	14.00	163.25	161.75	26.1	.37	2005
5	Three and one-half feet.	Two and one-half feet.	400	371	478	107.0	130.00	17.75	147.75	162.25	22.3	.33	2011
1	Three and one-half feet.	Two feet	500	498	631	109.0	177.25	15.50	192.75	112.25	30.8	.32	1391
4	Four feet	Four feet	250	284	464	110.0	165.00	12.75	177.75	142.25	24.7	.52	1536
3	Four feet	Three feet	333	287	440	100.0	174.50	10.50	185.00	150.00	25.7	.53	1620
6	Four feet	Two and one-half feet.	400	404	472	111.0	132.25	18.00	150.25	154.75	20.8	.30	1671
8	Four feet	Two feet	500	449	494	109.0	124.50	14.50	139.00	176.00	19.3	.25	1900
9	Five feet	Four feet	250	292	458	110.0	145.75	16.75	162.50	162.50	18.2	.46	1413
11	Five feet	Three feet	333	395	404	107.0	126.75	11.00	137.75	97.25	15.4	.29	846
10	Five feet	Two feet	500	379	490	109.0	145.00	13.50	158.50	136.50	17.7	.40	1187
12	Five feet	One and one-half feet.	666	471	487	106.0	117.75	16.50	134.25	150.75	15.0	.23	1311

TABLE VII—COMPILED RESULTS OF DISTANCE TESTS OF CORN—CON.

IREDELL FARM.

Rank According to Yield of Shelled Corn per Acre.	Distance Between Stalks.	Distance Between Stalks in Row.	No. Stalks per Plat.		Number Ears per Plat.	Average Height of Stalks in Inches at Maturity.	Yield per Plat in Pounds.				Total Bushels Shelled Corn per Acre.	Pounds Shelled Corn per Stalk.	Stover per Acre—Pounds.
			For Perfect Stand.	By Actual Count.			Large Ears.	Nubbins.	Total Corn on Cob.	Stover.			
6	Three and one-half feet.	Four feet	....	187	353	96.0	82.5	3.5	86.1	119.0	29.1	.38	2725
2	Three and one-half feet.	Three feet	....	218	384	102.0	88.0	4.0	92.0	153.0	31.2	.35	3503
5	Three and one-half feet.	Two and one-half feet.	....	233	405	100.0	84.0	4.0	88.0	137.0	29.8	.31	3137
4	Three and one-half feet.	Two feet	....	241	430	100.0	79.0	3.0	82.0	148.0	30.7	.28	3389
11	Four feet	Four feet	....	201	382	94.0	81.0	3.0	84.0	141.0	24.8	.34	2820
7	Four feet	Three feet	....	231	427	108.0	88.0	9.0	97.0	133.0	28.7	.34	2660
10	Four feet	Two and one-half feet.	....	216	399	100.0	79.0	10.0	89.0	146.0	26.3	.34	2920
9	Four feet	Two feet	....	243	452	102.0	78.0	13.0	91.0	149.0	26.9	.31	2980
3	Four feet	One and one-half feet.	....	281	527	94.0	91.0	14.0	105.0	175.0	31.1	.31	3500
12	Five feet	Four feet	....	198	364	90.0	95.0	5.0	100.0	80.0	23.7	.41	1280
11	Five feet	Three feet	....	214	503	96.0	94.0	11.0	105.0	135.0	24.8	.40	2160
8	Five feet	Two feet	....	243	478	110.0	111.0	10.0	121.0	174.0	28.6	.41	2784
1	Five feet	One and one-half feet.	....	301	590	102.0	118.0	15.0	133.0	202.0	31.5	.36	3232

TABLE VIII—COMPILED RESULTS OF DISTANCE TESTS OF CORN.

EDGECOMBE FARM.

Year.	Yield of Shelled Corn in Bushels per Acre at Different Distancing.																	
	3½ feet by 2 feet.	3½ feet by 2½ feet.	3½ feet by 3 feet.	3½ feet by 3½ feet.	3½ feet by 4 feet.	4 feet by 1½ feet.	4 feet by 2 feet.	4 feet by 2½ feet.	4 feet by 3 feet.	4 feet by 3½ feet.	4 feet by 4 feet.	5 feet by 1½ feet.	5 feet by 2 feet.	5 feet by 3 feet.	5 feet by 4 feet.
1901	----	----	----	----	----	----	28.6	----	28.4	----	24.4	----	22.5	24.3	23.0
1902	----	----	18.8	16.1	14.6	----	----	17.6	16.1	----	16.2	----	----	13.0	13.6
1903	22.0	----	----	26.8	23.7	----	----	27.4	23.0	----	25.0	----	24.6	19.5	18.7
1904	36.8	35.8	37.4	----	37.4	35.8	33.7	35.8	40.1	----	30.2	----	32.7	32.8	31.9
1905	16.1	12.7	22.7	----	29.6	12.7	18.1	18.3	15.8	----	17.6	----	26.1	20.4	20.6
1906	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1907	30.8	22.3	26.1	----	19.6	----	19.3	20.8	25.7	----	24.7	15.0	17.7	15.4	18.2
Averages	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

RED SPRINGS FARM.

1901	----	----	----	9.2	----	----	10.0	----	10.7	----	16.2	----	20.0	17.9	18.3
1902	----	----	----	14.8	----	----	11.9	----	14.4	----	11.4	----	12.2	11.3	10.9
1903	----	----	----	17.8	----	----	18.3	----	16.5	----	18.2	----	17.6	19.2	14.4
1904	----	----	----	23.3	----	----	----	----	----	21.8	----	----	23.6	20.8	----
Averages	----	----	----	16.3	----	----	----	----	----	----	----	----	18.4	17.3	----

IREDELL FARM.

1903	15.8	----	21.9	----	18.0	22.9	14.5	16.4	17.1	----	15.4	----	19.8	20.5	19.8
1904	42.4	----	39.3	----	40.6	36.4	35.1	39.3	35.4	----	41.0	----	46.9	37.2	31.0
1905	31.4	----	38.0	----	39.1	37.0	34.1	37.2	34.5	----	34.8	----	46.9	35.0	33.9
1906	27.8	26.9	27.2	----	24.3	----	20.5	28.8	25.9	----	24.3	28.8	23.8	17.5	18.4
1907	30.7	29.8	31.2	----	29.1	31.1	26.9	26.3	28.7	----	24.8	31.5	28.6	24.8	23.7
Averages	29.6	----	31.5	----	30.2	----	26.2	29.6	28.3	----	28.0	----	33.2	27.0	25.3

COMMENTS ON DISTANCE TESTS.

These tests were conducted this year at the Iredell and Edgecombe farms—seed of Cocke's Prolific having been used at Edgecombe and Weekley's Improved at Iredell for planting the different tests during all the years. The distancing best suited to the soil of the Edgecombe farm in its present state of fertility, as indicated by an average of six years' results, is 4 feet by 3 feet; at Iredell and Red Springs, as an average of three and five years' results, respectively, 5 feet by 2 feet. It will require a number of repetitions of this test to arrive at a fair idea of the best width of rows and distance in rows for planting corn on the types of soil used in the experiments. This will no doubt vary with the different kinds of corn, soil and season.

In Table VIII is presented in concise form the results of all distance tests with corn that have been conducted at the Edgecombe farm during six years, and the Red Springs farm during four years, and the Iredell farm during five years.

II. Variety and Distance Tests of Cotton.

Preparation and Cultivation.—All plats devoted to these tests were broke 8 to 10 inches deep during March at Edgecombe, and in April at Iredell, with a two-horse turning plow, followed by a thorough disking during the middle of April. Just before laying off the rows, which was during the last of April, the ground was gone over with a smoothing harrow. The rows were run 5 to 7 inches deep, 3⅓ feet apart, with an 8-inch shovel, and the fertilizer materials applied in the drill, at the following rate per acre in all tests:

Four hundred pounds of a mixture of acid phosphate, manure salt and dried blood, which contained 7 per cent available phosphoric acid, 2½ per cent potash and 2½ per cent nitrogen (equal to 3.04 per cent ammonia), costing $3.95, were used.

The cultivation was level, with cultivators, being moderately deep at the beginning of the season and shallower as the root zone increased. The cultivator was never run more than twice to the row at a time, as this more than covered the middle, and an effort was made to work over the plats as quickly as possible immediately after rains to break the crust formed by the showers and leave a dust mulch to check evaporation. The cultivator was run about 1½ to 2 inches deep toward the close of the season. It was attempted to cultivate every ten days, which had to be changed, of course, to suit the season. The cotton was reduced to a stand of 15 inches at Edgecombe and 16 inches at Iredell between the hills in the rows with the variety tests.

RESULTS OF VARIETY TESTS OF COTTON.

The results of these tests are included in the following tables:

TABLE IX—RESULTS OF

EDGECOMBE

Rank According to Selling Price of Total Products (Lint and Seed).	Varieties Tested.	Number of Stalks per Plat.		Average Height of Stalks in Inches at Maturity.	Yield of Seed Cotton in Pounds per Plat at the Several Pickings.				
		For Perfect Stand.	By Actual Count.		First Picking—November 1.	Second Picking—February 19.	Third Picking.	Fourth Picking.	Total Pickings.
1	Cleveland's Big Boll	555	308	43.0	36.50	29.75			66.25
2	Shine's Extra Early Prolific	555	236	44.0	36.50	30.00			63.50
3	Sugar Loaf	555	376	40.0	46.25	10.50			56.75
4	Brown's No. 1	555	407	43.0	31.00	20.50			51.50
5	Russell's Big Boll	555	256	43.0	26.50	32.25			58.75
6	Cook's Improved	555	377	41.0	20.25	30.00			50.25
7	Bigham's Improved	555	348	45.0	43.50	13.50			57.00
8	Simpkins' Prolific	555	298	38.0	28.50	19.75			48.25
9	Webb	555	365	40.0	49.50	3.75			53.25
10	Braswell's Cluster	555	346	45.0	46.75	4.75			51.50
11	Culpepper's Reimproved	555	253	43.0	23.50	26.00			49.50
12	King's Improved	555	271	37.0	31.50	13.50			45.00
13	Culpepper's Improved	555	306	37.0	27.25	20.75			48.00
14	Morgan's Climax	555	430	46.0	45.50	3.50			49.00
15	Hodge	555	272	39.0	42.50	2.25			44.75
16	Edgeworth	555	207	45.0	38.50	7.00			45.50
17	Dozier's Improved	555	211	42.0	33.75	10.00			43.75
18	Wilson's Matchless	555	307	43.0	36.00	8.00			44.00
19	Layton's Improved	555	245	44.0	33.50	5.00			38.50
20	Moss' Improved	555	286	41.0	10.50	26.25			36.75
21	Pullnot	555	323	40.0	22.50	16.75			39.25
22	Alexander Money-maker	555	275	43.0	17.25	18.75			36.00
23	Excelsior Prolific	555	293	43.0	34.50	3.50			38.00
24	Cluster	555	278	48.0	28.50	12.50			41.00
25	Peterkin's Improved	555	276	47.0	28.50	6.75			35.25
26	Mortgage Lifter	555	113	44.0	11.50	22.00			33.50
27	Black Texas Wood	555	266	50.0	9.50	17.50			27.50

VARIETY TESTS OF COTTON.

FARM.

Total Pounds Seed Cotton per Acre.	Number of Bolls Required to Yield One Pound of Seed Cotton.	Number of Seed in One Pound of Seed Cotton.	Pounds of Lint in 100 Pounds of Seed Cotton.	Pounds of Seed in 100 Pounds of Seed Cotton.	Pounds of Lint per Acre.	Pounds of Seed per Acre.	Value of Lint per Acre at 11 Cents per Pound.	Value of Seed per Acre at $1.00 per 100 Pounds or 30 Cents per Bushel.	Total Value of Lint and Seed per Acre.	Source of Seed.
1278.63	54	2000	35.14	64.86	449.3	829.3	$49.42	$ 8.29	$57.71	Georgia.
1225.55	69	2676	32.68	67.32	400.5	825.0	44.05	8.25	52.30	North Carolina.
1095.28	87	2825	36.28	63.72	397.3	697.9	43.70	6.97	50.67	North Carolina.
993.95	58	2312	38.49	61.51	382.5	611.4	42.08	6.11	48.19	Georgia.
1134.88	54	2000	31.95	68.05	362.5	772.3	39.87	7.72	47.59	Edgecombe Farm.
969.82	61	2353	38.61	61.39	374.4	595.4	41.18	5.95	47.13	Georgia.
1100.10	68	2567	32.90	67.10	361.9	438.2	39.80	4.38	44.18	North Carolina.
931.23	79	2812	36.68	63.32	341.5	589.7	37.56	5.90	43.46	North Carolina.
1027.73	83	2862	32.73	67.27	330.3	697.4	36.33	6.97	43.30	North Carolina.
993.95	76	2839	33.51	66.49	333.0	660.9	36.63	6.60	43.23	North Carolina.
955.35	54	2150	33.19	66.81	317.0	638.3	34.87	6.38	41.25	Georgia.
868.50	86	2921	37.40	62.60	324.8	543.7	35.72	5.44	41.16	Iredell Farm.
926.40	61	1959	33.80	66.18	313.3	613.1	34.46	6.13	40.59	Edgecombe Farm.
945.70	59	2331	31.51	68.49	297.9	647.8	32.76	6.48	39.24	South Carolina.
863.68	77	2630	35.00	65.00	302.2	561.4	33.24	5.61	38.85	North Carolina.
878.15	58	2199	32.81	67.19	288.1	590.0	31.69	5.90	37.59	Georgia.
844.38	71	2707	33.51	66.49	282.9	561.4	31.11	5.61	36.72	North Carolina.
849.20	69	2535	32.88	67.12	279.2	570.0	30.71	5.70	36.41	North Carolina.
743.05	71	2921	38.55	61.45	286.4	456.6	31.50	4.57	36.07	South Carolina.
709.28	74	3102	39.26	60.74	278.4	430.8	30.62	4.31	34.93	South Carolina.
757.53	58	2031	35.93	64.07	272.1	485.4	29.93	4.85	34.78	Georgia.
694.80	73	2966	38.80	61.20	269.5	425.3	29.65	4.25	33.90	Georgia.
733.40	74	2812	36.21	63.79	265.5	467.9	29.20	4.68	33.88	South Carolina.
791.30	76	2911	32.61	67.39	258.0	533.3	28.38	5.33	33.71	North Carolina.
680.33	72	3002	37.36	62.64	254.1	426.2	27.95	4.26	32.21	South Carolina.
646.55	56	1864	30.10	69.90	194.6	451.9	21.40	4.52	25.92	Georgia.
521.10	76	3215	36.57	63.43	190.5	330.6	20.95	3.30	24.25	North Carolina.

TABLE IX—RESULTS OF VARIETY

IREDELL

Rank According to Selling Price of Total Products (Lint and Seed).	Varieties Tested.	Number of Stalks per Plat.		Average Height of Stalks in Inches at Maturity.	Yield of Seed Cotton in Pounds per Plat at the Several Pickings.				
		For Perfect Stand.	By Actual Count.		First Picking—October 11.	Second Picking—November 27.	Third Picking.	Fourth Picking.	Total Pickings.
1	Pullnot	520	434	30.0	39.14	32.50			71.64
2	King's Improved	520	523	40.0	52.21	15.00			67.21
3	Cook's Improved	520	465	36.0	30.31	27.00			57.31
4	King's Improved (native)	520	525	33.0	47.17	13.25			60.42
5	Brown's No. 1	520	431	40.0	30.30	25.00			55.30
6	Sugar Loaf	520	497	36.0	46.30	10.00			56.30
7	Cleveland Big Boll	520	429	35.0	37.06	21.00			58.06
8	Simpkins' Prolific	520	442	42.0	41.25	12.25			53.50
9	Culpepper's Reimproved	520	407	44.0	25.10	30.50			55.60
10	Mortgage Lifter	520	435	45.0	26.16	29.00			55.10
11	Wilson's Matchless	520	472	48.0	32.65	21.50			54.15
12	Alexander Money-maker	520	478	32.0	24.21	26.50			50.71
13	Moss' Improved	520	436	40.0	19.35	26.50			45.85
14	Bigham's Improved	520	450	32.0	39.30	14.00			53.30
15	Williams'	520	490	33.0	37.61	10.00			47.61
16	Drake's Defiance	520	402	34.0	28.87	24.00			52.87
17	Excelsior Prolific	520	492	42.0	24.38	24.00			48.38
18	Dozier's Improved	520	423	30.0	39.20	11.00			50.20
19	Shine's Extra Early Prolific	520	426	36.0	31.21	18.25			49.46
20	Edgeworth	520	542	30.0	19.19	23.00			42.19
21	Cluster	520	442	44.0	17.25	24.00			41.25
22	Black Texas Wood	520	445	42.0	15.72	21.25			36.97
23	Webb	520	478	32.0	17.62	17.00			34.62
24	Braswell's Cluster	520	550	30.0	14.15	20.00			34.15

TESTS OF COTTON—CONTINUED.

FARM.

Total Pounds Seed Cotton per Acre.	Number of Bolls Required to Yield One Pound of Seed Cotton.	Number of Seed in One Pound of Seed Cotton.	Pounds of Lint in 100 Pounds of Seed Cotton.	Pounds of Seed in 100 Pounds of Seed Cotton.	Pounds of Lint per Acre.	Pounds of Seed per Acre.	Value of Lint per Acre at 11 Cents per Pound.	Value of Seed per Acre at $1.00 per 100 Pounds or 30 Cents per Bushel.	Total Value of Lint and Seed per Acre.	Source of Seed.
1432.80	61	1950	38.69	61.31	554.3	878.5	$60.97	$ 8.79	$69.76	Georgia.
1344.20	83	2811	37.92	62.08	509.7	834.5	56.06	8.36	64.42	Iredell Test Farm.
1146 20	63	2221	39.71	60.29	455.0	691.2	50.05	6.91	56.96	Georgia.
1208.40	85	2665	36.36	63.64	439.3	769.1	48.32	7.69	56.01	North Carolina.
1106.00	76	2267	39.58	60.42	438.0	668.0	48.18	6.68	54.86	Georgia.
1126.00	95	2811	38.54	61.46	434.0	692.0	47.74	6.92	54.66	North Carolina.
1161.20	63	1904	36.94	63.06	429.0	732.2	47.19	7.32	54.51	Georgia.
1070.00	79	2902	37.61	62.39	402.4	667.6	44.26	6.68	50.94	North Carolina.
1112.00	62	2086	34.69	65.31	385.7	726.3	42.42	7.26	49.68	Edgecombe Test Farm.
1102.00	60	2176	35.06	64.94	386.3	715.7	42.49	7.16	49.65	Georgia.
1083.00	71	2528	34.99	65.01	379.0	704.0	41.69	7.04	48.73	North Carolina.
1014.20	82	2964	37.24	62.76	378.0	636.2	41.58	6.36	47.88	Georgia.
917.00	73	3079	41.15	58.85	377.3	539.7	41.50	5.40	46.90	South Carolina.
1066.00	76	2584	33.80	66.20	363.3	705.7	39.63	7.06	46.69	North Carolina.
952.20	89	2502	38.98	61.02	371.2	581.0	40.83	5.81	46.64	North Carolina.
1057.40	73	2584	33.90	66.10	358.4	699.0	39.42	6.99	46.41	Georgia.
967.60	72	2312	37.09	62.91	359.0	608.6	39.49	6.09	45.58	North Carolina.
1004.00	82	2779	34.45	65.55	346.0	658.0	38.06	6.58	44.60	North Carolina.
989.20	82	2457	34.56	65.44	342.1	647.1	37.63	6.47	44.10	North Carolina.
848.80	69	2539	37.21	62.79	314.0	529.0	34.54	5.29	39.83	Georgia.
825.00	79	2856	34.87	65.13	287.6	537.4	31.63	5.37	37.00	North Carolina.
739.40	82	3174	37.12	62.88	274.4	465.0	30.18	4.65	34.83	North Carolina.
692.40	88	2766	34.70	65.30	240.2	452.2	26.42	4.52	30.94	North Carolina.
683.00	86	2811	35.05	64.95	239.3	443.7	26.32	4.44	30.76	North Carolina.

TABLE X—COMPILED RESULTS OF VARIETY TESTS OF COTTON.

EDGECOMBE FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.
Russell's Big Boll	1265.0	3	1487.0	1	1675.0	1	1193.7	7	1941.3	4	2096.5	3	1046.1	20	1134.9	5	1479.9	1
Culpepper's Improved.	1125.6	4	1302.0	3	1230.0	5	1028.5	9	2031.3	1	1983.3	2	1201.6	13	926.4	13	1353.5	2
Moss' Improved	1305.0	1	999.0	6	------	----	------	----	1287.9	17	1604.6	8	1038.2	10	709.3	20	------	----
Breeden's Prolific	1205.0	2	------	----	------	----	------	----	------	----	------	----	------	----	------	----	------	----
Todd's Improved	1000.0	5	------	----	------	----	------	----	------	----	------	----	------	----	------	----	------	----
Strickland's Improved.	950.0	6	1142.0	4	------	----	------	----	------	----	------	----	------	----	------	----	------	----
Lewis' Prize	770.0	7	------	----	------	----	------	----	------	----	------	----	------	----	------	----	------	----
Hawkins' Extra Prolific.	740.5	8	1053.0	5	------	----	------	----	------	----	------	----	1006.6	17	------	----	------	----
Peterkin's Improved.	------	----	1215.0	2	1372.5	2	1291.3	4	1363.6	16	1697.8	6	------	----	680.3	25	------	----
Griffin's Improved	------	----	957.0	7	------	----	------	----	------	----	------	----	------	----	------	----	------	----
Truitt's Improved	------	----	------	----	1335.0	3	1036.0	8	------	----	1397.6	21	------	----	------	----	------	----
Daughtridge's	------	----	------	----	1230.0	4	1336.3	6	------	----	------	----	------	----	------	----	------	----
Blue Ribbon	------	----	------	----	1170.0	6	------	----	------	----	------	----	------	----	------	----	------	----
King's Improved	------	----	------	----	885.0	7	1381.4	3	1747.2	3	------	----	981.5	16	868.5	12	------	----
Excelsior Prolific	------	----	------	----	------	----	1621.6	2	1761.4	7	1756.9	1	------	----	733.4	23	------	----
Edgeworth	------	----	------	----	------	----	1691.6	1	1733.0	10	1840.6	10	1251.6	8	878.2	16	------	----
Garrard's Improved Prolific.	------	----	------	----	------	----	1332.3	5	------	----	------	----	------	----	------	----	------	----
Cook's Improved	------	----	------	----	------	----	------	----	1818.2	2	1747.5	5	1329.4	1	969.8	6	------	----
Hodge	------	----	------	----	------	----	------	----	1756.6	5	1904.5	4	------	----	863.7	15	------	----
Mebane's Triumph	------	----	------	----	------	----	------	----	1775.6	6	------	----	------	----	------	----	------	----
Webb	------	----	------	----	------	----	------	----	1780.3	8	1688.0	17	1270.1	4	1027.7	9	------	----
Tool's Early Prolific.	------	----	------	----	------	----	------	----	1666.7	9	1668.3	7	------	----	------	----	------	----
Shine's Extra Early Prolific.	------	----	------	----	------	----	------	----	1728.2	11	1850.4	15	982.9	21	1225.6	2	------	----
Texas Big Boll	------	----	------	----	------	----	------	----	1643.0	12	------	----	1089.6	14	------	----	------	----
Speight's Prolific	------	----	------	----	------	----	------	----	1524.6	13	------	----	------	----	------	----	------	----
Brown Texas Wood.	------	----	------	----	------	----	------	----	1415.7	14	------	----	827.4	26	------	----	------	----
Black Texas Wood.	------	----	------	----	------	----	------	----	1543.6	15	1747.5	9	977.6	15	521.1	27	------	----
Missionary	------	----	------	----	------	----	------	----	1572.0	18	------	----	------	----	------	----	------	----
Peterkin's Improved (Craig's)	------	----	------	----	------	----	------	----	1534.1	19	1496.6	18	------	----	------	----	------	----
White's Long Staple.	------	----	------	----	------	----	------	----	1548.3	20	------	----	------	----	------	----	------	----
Florodora	------	----	------	----	------	----	------	----	1306.8	21	------	----	------	----	------	----	------	----

TABLE X—COMPILED RESULTS OF VARIETY TESTS OF COTTON—CON.

EDGECOMBE FARM.

arieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.
lson's Matchless											1678.2	16	1242.4	12	849.2	18		
ckson Limbless (Wilt Resistant).											1535.4	12						
kson Limbless (No. 128-1-29-11).											1181.1	23						
zier's Improved											1387.8	20	1193.7	11	844.4	17		
rry's Big Boll											1496.6	22						
yton's Improved											1535.4	13			743.1	19		
d Standard											1643.7	14						
swell's Cluster											1520.7	19	1268.8	3	993.9	10		
tler's Early Prolific.											1845.5	11	1030.3	19				
wn's No. 1													1252.9	2	993.9	4		
adwell's Double-jointed.													1243.7	5				
ham's Improved.													1303.0	6	1100.1	7		
uble-header													1281.9	7				
ake's Defiance													1196.3	9				
pkins' Prolific													952.6	18	931.2	8		
proved Russell's Big Boll.													984.2	22				
rtgage Lifter													961.8	23	646.6	26		
tle's Improved													876.1	24				
l Rust Proof													797.1	25				
veland's Big Boll.															1278.6	1		
ar Loaf															1095.3	3		
pepper's Reimproved.															954.4	11		
gan's Climax															945.7	14		
lnot															757.5	21		
xander Money-maker.															694.8	22		
ster															791.3	24		

TABLE X—COMPILED RESULTS OF VARIETY TESTS OF COTTON—CON.

RED SPRINGS FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		Averages.	
	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.
Russell's Big Boll	675.0	3	496.3	1	1070.0	3	887.9	7	557.6	5	737.4	4
Culpepper's Improved (Edgecombe).	734.4	1	477.0	2	1218.5	1	897.2	4	------	------	831.8	1
Culpepper's Improved (Red Springs).	------	------	------	------	------	------	915.9	3	635.2	2	------	------
Peterkin's Improved	660.0	2	440.0	4	982.5	2	915.9	2	441.4	10	688.0	5
Daughty's Excelsior	655.0	4	------	------	------	------	------	------	------	------	------	------
Allen's Long Staple	635.0	7	------	------	------	------	------	------	------	------	------	------
Excelsior Prolific	635.0	6	------	------	895.0	5	943.9	1	548.0	3	755.5	2
Texas Burr	630.0	5	------	------	------	------	------	------	------	------	------	------
Groveton	605.0	7	------	------	------	------	------	------	------	------	------	------
Native	530.0	8	------	------	------	------	------	------	------	------	------	------
Griffin's Improved	------	------	473.1	3	------	------	------	------	------	------	------	------
Hawkins' Extra Prolific	------	------	448.3	5	------	------	------	------	------	------	------	------
Moss' Improved	------	------	417.0	6	------	------	------	------	334.5	17	------	------
Sea Island	------	------	255.0	7	------	------	------	------	------	------	------	------
King's Improved	------	------	------	------	910.0	4	813.1	6	500.5	6	741.2	3
Peterkin's Improved (Craig's).	------	------	------	------	------	------	------	------	347.7	19	------	------
Truitt's Improved	------	------	------	------	------	------	411.2	8	------	------	------	------
Edgeworth	------	------	------	------	------	------	925.2	5	491.0	9	------	------
Cook's Improved	------	------	------	------	------	------	------	------	680.4	1	------	------
Tool's Early Prolific	------	------	------	------	------	------	------	------	490.1	4	------	------
Webb	------	------	------	------	------	------	------	------	503.2	7	------	------
Hodge	------	------	------	------	------	------	------	------	494.9	8	------	------
Speight's Prolific	------	------	------	------	------	------	------	------	431.0	11	------	------
Shine's Extra Early Prolific.	------	------	------	------	------	------	------	------	452.6	12	------	------
Black Texas Wood	------	------	------	------	------	------	------	------	413.6	13	------	------
Brown Texas Wood	------	------	------	------	------	------	------	------	382.5	14	------	------
Missionary	------	------	------	------	------	------	------	------	396.4	15	------	------
Texas Big Boll	------	------	------	------	------	------	------	------	392.7	16	------	------
White's Long Staple	------	------	------	------	------	------	------	------	383.7	18	------	------
Florodora	------	------	------	------	------	------	------	------	312.1	20	------	------

ABLE X—COMPILED RESULTS OF VARIETY TESTS OF COTTON—Con.

IREDELL FARM.

arieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.
ng's Improved (Native).							750.0	1	900.0	2	985.4	1	865.0	3	1208.40	4	941.6	2
ng's Improved							655.0	2	1005.0	1	765.2	11	960.0	1	1344.20	2	945.8	1
ssell's Big Boll							640.0	3	835.0	7								
lpepper's Improved.							630.0	5	790.0	8	974.0	4	560.0	16				
geworth							605.0	4	760.0	11	873.0	12	670.0	13	848.80	20	751.3	3
celsior Prolific							475.0	6	790.0	6	801.6	10			967.60	17		
rrard's Improved Prolific.							410.0	7										
itt's Improved							360.0	9			750.6	22						
terkin's Improved.							290.0	8	495.0	21	743.4	20						
bb									920.0	3	946.5	5	680.0	11	692.40	23		
dge									805.0	4	1082.0	2						
ol's Early Prolific.									575.0	17	816.6	13						
ok's Improved									695.0	10	938.0	3			1146.20	3		
ssionary									745.0	9								
eight's Prolific									660.0	13								
ine's Extra Early Prolific.									825.0	5	926.6	7	720.0	4	989.20	19		
xas Big Boll									635.0	16			540.0	17				
ack Texas Wood									525.0	20	805.8	15	600.0	14	739.40	22		
terkin's Improved (Craig).									670.0	15	784.6	21						
ss' Improved									500.0	19	706.2	18	595.0	7	917.00	13		
hite's Long Staple.									525.0	24								
own Texas Wood.									615.0	12			505.0	18				
rodora									440.0	25								
kson Limbless									465.0	23								
bane's Triumph									460.0	22								
nes' Improved									600.0	18								
celsior									650.0	14								
lson's Matchless											965.6	6	690.0	5	1083.00	11		
kson Limbless (Wilt Resistant).											720.2	19						
kson Limbless No. 128-1-29-11).											558.4	23						
zier's Improved											890.8	9	685.0	8	1004.00	18		

TABLE X—COMPILED RESULTS OF VARIETY TESTS OF COTTON—CON.

IREDELL FARM.

Varieties Tested.	1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		Averages.	
	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.	Yield in Pounds Seed Cotton per Acre.	Rank According to Value of Total Products.
Berry's Big Boll											909.6	17						
Layton's Improved											791.2	14						
Gold Standard											787.2	16						
Butler's Early Prolific.											894.6	8						
Broadwell's Double-jointed.													900.0	2				
Bigham's Improved.													650.0	6	1066.00	14		
Drake's Defiance													690.0	9	1057.40	16		
Improved Russell's Big Boll.													700.0	10				
Brown's No. 1													600.0	12	1106.00	5		
Hawkins' Extra Prolific.													560.0	15				
Mortgage Lifter													545.0	15	1102.00	10		
Double-header													530.0	19				
Pullnot															1432.80	1		
Sugar Loaf															1126.00	6		
Cleveland Big Boll															1161.20	7		
Simpkins' Prolific															1070.00	8		
Culpepper's Reimproved.															1112.00	9		
Alexander Moneymaker.															1014.00	12		
Williams'															952.20	15		
Cluster															825.00	21		
Braswell's Cluster															683.00	24		

TABLE XI—SHOWING RELATIVE EARLINESS, VALUE, YIELD, AND SIZE OF BOLLS, SEED AND STALKS OF VARIETIES OF COTTON TESTED IN 1907.

EDGECOMBE FARM.

Varieties.	Percentage of Cotton Open at the Several Pickings.			Rank According to the Following Characters.								
	First Picking—November 1.	Second Picking—February 19.	Third Picking.	Earliness as Shown by Percentage Open at First Picking.	Value of Total Products (Lint and Seed).	Yield of Lint per Acre—Pounds.	Yield of Seed per Acre—Pounds.	Percentage of Lint.	Percentage of Seed.	Largeness of Bolls.	Largeness of Seed.	Height of Stalks.
Cleveland's Big Boll	55.09	44.91	....	19	1	1	1	13	14	1	3	7
Shine's Extra Early Prolific	54.87	45.13	....	20	2	2	2	22	5	7	13	6
Sugar Loaf	81.49	18.51	....	9	3	3	4	10	17	17	16	10
Brown's No. 1	60.19	39.81	....	15	4	4	10	5	22	3	7	7
Russell's Big Boll	45.10	54.90	....	23	5	6	3	24	3	1	3	7
Cook's Improved	40.29	57.71	....	24	6	5	11	3	24	5	9	9
Bigham's Improved	76.31	26.69	....	12	7	7	22	18	9	6	11	5
Simpkins' Prolific	59.06	40.94	....	16	8	8	13	8	19	14	15	12
Webb	92.95	7.05	....	2	9	10	5	21	6	15	18	10
Braswell's Cluster	90.77	9.23	....	5	10	9	6	16	11	12	17	5
Culpepper's Reimproved	47.47	52.53	....	22	11	12	8	17	10	1	5	7
King's Improved	70.00	30.00	....	13	12	11	16	6	21	16	20	13
Culpepper's Improved	56.77	43.23	....	18	13	13	9	15	12	5	2	13
Morgan's Climax	92.85	7.15	....	3	14	15	7	25	2	4	8	4
Hodge	94.97	5.03	....	1	15	14	15	14	13	13	12	11
Edgeworth	84.61	15.39	....	7	16	16	12	20	7	3	6	5
Dozier's Improved	77.14	22.86	....	11	17	18	15	16	11	8	14	8
Wilson's Matchless	81.81	18.19	....	8	18	19	14	19	8	7	10	7
Layton's Improved	87.01	12.99	....	6	19	17	20	4	23	8	20	6
Moss' Improved	28.57	71.43	....	27	20	20	23	1	26	11	23	9
Pullnot	57.32	42.68	....	17	21	21	18	12	15	3	4	10
Alexander Money-maker	47.91	52.09	....	21	22	22	26	2	25	10	21	7
Excelsior Prolific	90.78	9.22	....	4	23	23	19	11	16	11	15	7
Cluster	69.51	30.49	....	14	24	24	17	23	4	12	19	2
Peterkin's Improved	80.85	19.15	....	10	25	25	25	7	20	9	22	3
Mortgage Lifter	34.32	65.68	....	26	26	26	21	26	1	2	1	6
Black Texas Wood	35.18	64.82	....	25	27	27	24	9	18	12	24	1

TABLE XI—SHOWING RELATIVE EARLINESS, VALUE, YIELD, AND SIZE OF BOLLS, SEED AND STALKS OF VARIETIES OF COTTON TESTED IN 1907—CON.

IREDELL FARM.

Varieties.	Percentage of Cotton Open at the Several Pickings.			Rank According to the Following Characters.								
	First Picking—October 2.	Second Picking—November 16.	Third Picking.	Earliness as Shown by Percentage Open at First Picking.	Value of Total Products (Lint and Seed).	Yield of Lint per Acre—Pounds.	Yield of Seed per Acre—Pounds.	Percentage of Lint.	Percentage of Seed.	Largeness of Bolls.	Largeness of Seed.	Height of Stalks.
Pullnot	54.63	45.37	....	12	1	1	1	5	20	2	2	11
King's Improved	77.68	22.32	....	5	2	2	2	7	18	12	16	5
Cook's Improved	52.88	47.12	....	14	3	3	11	2	22	4	5	6
King's Improved (Native)	78.06	21.94	....	4	4	4	3	14	11	13	13	9
Brown's No. 1	54.79	45.21	....	11	5	5	12	3	23	9	6	5
Sugar Loaf	82.23	17.77	....	1	6	6	10	6	19	17	16	6
Cleveland Big Boll	63.83	36.17	....	8	7	7	4	13	12	4	1	7
Simpkins' Prolific	77.10	22.90	....	6	8	8	13	8	17	10	18	4
Culpepper's Reimproved	45.14	54.86	....	20	9	10	5	20	5	3	3	3
Mortgage Lifter	47.47	52.53	....	18	10	9	6	15	10	1	4	2
Wilson's Matchless	60.29	39.71	....	10	11	11	8	17	8	6	10	1
Alexander Money-maker	47.74	52.26	....	17	12	12	16	9	16	11	18	10
Moss' Improved	42.20	57.80	....	22	13	13	19	1	24	8	19	5
Bigham's Improved	73.73	26.27	....	7	14	15	7	24	1	9	12	10
Williams'	78.99	21.01	....	2	15	14	18	4	21	16	9	9
Drake's Defiance	54.60	45.30	....	13	16	17	9	23	2	8	12	8
Excelsior Prolific	50.39	49.61	....	16	17	16	17	12	13	7	7	4
Dozier's Improved	78.08	21.92	....	3	18	18	14	22	3	11	15	11
Shine's Extra Early Prolific	63.10	36.90	....	9	19	19	15	21	4	11	8	6
Edgeworth	45.48	54.52	....	19	20	20	21	10	15	5	11	11
Cluster	41.81	58.19	....	23	21	21	20	18	7	10	17	3
Black Texas Wood	42.52	57.48	....	21	22	22	22	11	14	11	19	4
Webb	50.89	49.11	....	15	23	23	23	19	6	15	14	10
Braswell's Cluster	41.43	58.57	....	24	24	24	24	16	9	14	16	11

TABLE XII. COMPILED RESULTS OF VARIETY TESTS OF COTTON, SHOWING RELATIVE EARLINESS, VALUE, YIELDS, AND SIZE OF BOLLS AND STALKS.[1]

EDGECOMBE FARM.

Varieties.	Number of Years Tested.	Rank According to the Following Characters.								
		Value of Total Products (Seed and Lint).	Yield of Lint per Acre—Pounds.	Yield of Seed per Acre—Pounds.	Percentage of Lint.	Percentage of Seed.	Largeness of Bolls.	Largeness of Seed.[2]	Earliness as shown by Percentage of Bolls Open at First Picking.[3]	Height of Stalks.[4]
Russell's Big Boll	4	3	3	1	6	2	1	1	6	3
Culpepper's Improved	4	2	2	2	4	4	2	4	4	4
Edgeworth	4	5	4	5	5	3	4	2	2	1
Cook's Improved	4	1	1	6	1	7	3	3	5	6
Webb	4	4	5	4	3	5	6	6	1	5
Shine's Extra Early Prolific	4	6	6	3	7	1	5	5	3	2
Black Texas Wood	4	7	7	7	2	6	6	7	7	3

RED SPRINGS FARM.

Russell's Big Boll	2	5	6	2	5	1	1	1	5	6
Edgeworth	2	3	5	3	4	2	3	3	1	5
Culpepper's Improved	2	2	2	1	3	3	2	2	2	2
Peterkin's Improved	2	6	3	5	2	4	4	5	4	3
King's Improved	2	1	4	6	1	5	6	6	6	4
Excelsior Prolific	2	4	1	4	2	4	5	4	3	1

IREDELL FARM.

King's Improved (Native)	5	2	2	1	2	2	2	3	1	2
King's Improved	5	1	1	2	1	3	2	1	2	1
Edgeworth	5	3	3	3	3	1	1	2	3	1

[1]The comparisons of varieties in this table are the average of results of tests of 1903, 1904, 1905, 1906 and 1907 at Iredell; of 1904, 1905, 1906 and 1907 at Edgecombe, and of 1903 and 1904 at Red Springs.

[2]Results in this column for Red Springs farm were obtained from data of 1904 only.

[3]Results in this column for the Iredell and Edgecombe farms were obtained from data of 1904, 1905, 1906 and 1907 at the former, and 1904, 1905 and 1907 at the latter.

[4]Results in this column for the Edgecombe farm were obtained from data of 1906 and 1907.

COMMENTS ON VARIETY TESTS OF COTTON.

The varieties tested this year at the Edgecombe and Iredell farms are arranged in Table IX in the order of their selling price of "total products," when lint is selling at 11 cents per pound and seed at 30 cents per bushel. This order may not be the order of productivity of seed cotton, as is shown in the tests this year at both the Edgecombe and Iredell farms. For example, at the Edgecombe farm, although Russell's Big Boll produced more seed cotton than Brown's No. 1 and Sugar Loaf, each ranked higher in value of total products. The same was true of Cleveland's Big Boll, when compared with Brown's No. 1 and Cook's Improved at the Iredell farm.

The reason for some varieties with smaller yields of seed cotton producing more lint and hence greater selling price per acre than some others with a larger amount of seed cotton per acre, is due to the former varieties producing a higher percentage of lint to seed.

To eliminate inequalities in the land, if any, the different varieties at the separate farms were planted each in separate rows, arranged consecutively, and this plan repeated a sufficient number of times to give the designated acreage. It is absolutely essential, in order to eliminate soil and weather conditions as much as possible, to continue work of this kind for some years on different types of soils before attempting to draw definite conclusions.

The yields for this year are presented in Table IX, while the average rank in value of total products of the several varieties tested during the past seven years is shown in Table X. Taking the whole variety test at the Edgecombe farm, the stand was very irregular and poor. The late, cold spring was largely the cause of this defect in stand. It should not be overlooked, however, that all the varieties were planted in the same way, on the same day, on uniform land, and given the same fertilization and cultural treatment, hence the results are valuable as showing the ability of certain varieties to withstand adverse seasonal conditions and produce paying yields, which is a matter of considerable importance. At the Iredell farm the stand of the different varieties was considerably better than at the Edgecombe, but the yields at both farms were comparatively small, as an unusually early frost in the fall cut off the crop from one-third to one-half. Two pickings were made of the varieties this year at both the Edgecombe and Iredell farms. Of the varieties that have been tested continuously at the different farms since the inauguration of variety testing at them, as seen by Table X, Russell's Big Boll and Culpepper's Improved, as an average of eight years' tests, have ranked as the best varieties at the Edgecombe farm; Culpepper's Improved, Excelsior Prolific, King's Improved and Russell's Big Boll were best at Red Springs as an average of five years' tests; while King's Improved, King's Improved (native) and Edgeworth were highest at the Iredell farm as an average of five years' testing.

In this connection it is interesting to note that in the several tests of cotton on the different farms the differences between the one yielding the highest amount of seed cotton per acre and the one the lowest in the individual tests ranged from 530 to 915 pounds of seed cotton at Edgecombe, with the number of varieties ranging from seven to twenty-seven during the past eight years; at Red Springs, 204 to 533 pounds during five years, with from five to twenty varieties; and at Iredell, from 455 to 565 pounds when using from nine to twenty-five varieties in the different tests during the past five years.

These results speak in no uncertain terms as to the importance and value of good seed which are adapted to the different soils and localities of the State.

In Table XI is given the rank of the varieties tested this year according to certain characteristics; while Table XII shows the average ranking of three years at Edgecombe, two at Red Springs and five at Iredell. Both of these tables will be found to contain much information, compiled in compact form.

NOTES ON VARIETIES OF COTTON TESTED IN 1907.

Russell's Big Boll is a hardy, large-bolled and vigorous-growing variety that yields well, especially on a loamy or sandy soil in the eastern part of the State, and is very popular with pickers. In value of total products (lint and seed) it stood third in 1900 and 1905, first in 1901 and 1902, seventh in 1903, fourth in 1904, twentieth in 1906 and fifth in 1907 at the Edgecombe farm; third in 1900 and 1902, first in 1901, seventh in 1903 and fifth in 1904 at Red Springs; third in 1903 and seventh in 1904 at Iredell. In ordinary seasons this variety is not only prolific, but fairly reliable, especially on the well-drained sandy or loamy soil of the east. This season it was greatly cut off by an early frost.

Culpepper's Improved is a large-bolled variety, yielding generally a little less per boll than Russell's Big Boll. It ranked fourth in 1900, third in 1901, fifth in 1902, ninth in 1903, seventeenth in 1904, second in 1905, thirteenth in 1906 and 1907 at the Edgecombe farm; first in 1900, second in 1901, first in 1902, third from Red Springs seed and fourth from Edgecombe seed in 1903, second from Red Springs seed in 1904 at the Red Springs farm; fifth, eighth, fourth and sixteenth in 1903, 1904, 1905 and 1906, respectively, at Iredell. This variety is earlier by about ten days and seems to be more subject to variation than Russell's Big Boll, but, notwithstanding this last defect, is considered a good, reliable variety. Being a late-maturing variety, and having a short growing season this year, it was cut off some by frost. It has a large-sized weed, with spreading limbs, well bolled, and holds cotton well.

King's Improved has a boll a little smaller than Peterkin's Improved, but does not generally yield quite as high percentage of lint. It has a rather small stalk, with spreading limbs. This and Dozier's Improved are two of the earliest-maturing varieties thus far tested. It occupied seventh place in 1902, third in 1903 and 1904, sixteenth in 1906 and twelfth in 1907 at Edgecombe; fourth in 1902, sixth in 1903 and 1904 at Red Springs; second in 1903, first in 1904 and 1906, eleventh in 1905 and second in 1907 at Iredell.

Edgeworth stood first in 1903, tenth in 1904 and 1905, eighth in 1906 and sixteenth in 1907 at Edgecombe; fifth in 1903 and ninth in 1904 at Red Springs; fourth in 1903, eleventh in 1904, twelfth in 1905, thirteenth in 1906 and twentieth in 1907 at Iredell. It has a rather heavy stalk, large leaves and short stems, and is ordinarily a rather late-maturing variety.

Moss' Improved stood first in 1900, sixth in 1901, seventeenth in 1904, eighth in 1905, tenth in 1906 and twentieth in 1907 at Edgecombe; sixth in 1901 and seventeenth in 1904 at Red Springs; nineteenth in 1904, eighteenth in 1905, seventeenth in 1906 and thirteenth in 1907 at Iredell. This variety possessed as high percentage of lint as any other variety tested during the past three years.

Cook's Improved ranked second in 1904, fifth in 1905, first in 1906 and sixth in 1907 at Edgecombe; tenth in 1904, third in 1905 and third in 1907 at Iredell. It is a medium early maturing variety.

Webb occupied eighth and seventeenth places at Edgecombe in 1904 and 1905, fourth in 1906 and ninth in 1907; seventh at Red Springs in 1904; and third, fifth, eleventh and twenty-third in 1904, 1905, 1906 and 1907 at Iredell. Has rather small bolls and seeds.

Shine's Extra Early Prolific ranked eleventh in 1904, fifteenth in 1905, twenty-first in 1906 and second in 1907 at Edgecombe; twelfth at Red Springs in 1904; and fifth in 1904, seventh in 1905, fourth in 1906 and nineteenth in 1907 at Iredell. Our tests of three years indicate this to be a rather early maturing variety.

Black Texas Wood ranked fifteenth in 1904 and 1906, ninth in 1905 and twenty-seventh in 1907 at Edgecombe; thirteenth at Red Springs in 1904; twentieth in 1904, fifteenth in 1905, fourteenth in 1906 and twenty-second in 1907 at Iredell. This is a late-maturing variety.

King's Improved (native) stood first in 1903 and 1905, second in 1904, third in 1906 and fourth in 1907 at the Iredell farm.

Wilson's Matchless ranked sixteenth in 1905, twelfth in 1906 and eighteenth in 1907 at Edgecombe; sixth in 1905, fifth in 1906 and eleventh in 1907 at Iredell.

Dozier's Improved ranked twentieth in 1905, eleventh in 1906 and seventeenth in 1907 at Edgecombe; ninth in 1905, eighth in 1906 and eighteenth in 1907 at Iredell. This is a small-bolled and very early-maturing variety.

Brown's No. 1 ranked second in 1906 and fourth in 1907 at Edgecombe; twelfth in 1906 and fifth in 1907 at Iredell.

Braswell's Cluster ranked nineteenth in 1905, third in 1906 and tenth in 1907 at Edgecombe; and twenty-fourth at Iredell in 1907.

Bigham's Improved ranked sixth in 1906 and seventh in 1907 at Edgecombe; and sixth in 1906 and fourteenth in 1907 at Iredell.

Drake's Defiance ranked ninth in 1906 at Edgecombe; and ninth in 1906 and sixteenth in 1907 at Iredell.

Simpkins' Prolific ranked eighteenth in 1906 and eighth in 1907 at Edgecombe; and eighth in 1907 at Iredell.

Mortgage Lifter ranked twenty-third in 1906 and twenty-sixth in 1907 at Edgecombe; and fifteenth in 1906 and tenth in 1907 at Iredell.

Cleveland's Big Boll ranked first at Edgecombe and seventh at Iredell in this year's tests.

Hodge ranked fifth in 1904, fourth in 1905 and fifteenth in 1907 at Edgecombe; and fourth in 1904 and second in 1905 at Iredell.

Peterkin's Improved ranked second in 1901 and 1902, fourth in 1903, sixteenth in 1904, sixth in 1905 and twenty-fifth in 1907 at Edgecombe; eighth in 1903, twenty-first in 1904 and twentieth in 1905 at Iredell.

Excelsior Prolific ranked second in 1903, seventh in 1904, first in 1905 and twenty-third in 1907 at Edgecombe; sixth in 1903 and 1904, tenth in 1905 and seventeenth in 1907 at Iredell.

Alexander Money-maker ranked twenty-second at Edgecombe and twelfth at Iredell in this year's tests.

Morgan's Climax ranked fourteenth at Edgecombe in this year's tests.

Culpepper's Reimproved ranked eleventh at Edgecombe and ninth at Iredell in this year's tests.

Layton's Improved ranked thirteenth in 1905 and nineteenth in 1907 at Edgecombe, and fourteenth in 1905 at Iredell.

Pullnot ranked twenty-first at Edgecombe and first at Iredell in this year's tests.

Sugar Loaf ranked third at Edgecombe and sixth at Iredell in this year's tests.

Cluster ranked twenty-fourth at Edgecombe and twenty-fourth at Iredell in this year's tests.

Williams' ranked fifteenth at Iredell in this year's tests.

STUDY OF COMPILED RESULTS OF VARIETY TESTS OF COTTON.

Eight years ago the Department of Agriculture, by means of its test farms, began comparative tests of varieties of cotton, with the purpose, primarily, of ascertaining, if possible, the varieties that are most prolific of seed cotton per acre when grown under our conditions of soil and climate. During this time tests have been made of seven varieties in 1900 to twenty-seven in 1907 in the tests on the different farms. It is felt from these accumulated data of eight years' tests that some very reliable and valuable information has been derived, especially if taken and intelligently applied by the individual farmers of the State in their farming operations.

VARIATION IN YIELD OF VARIETIES.

In our variety tests we have had some variety or varieties to yield 700 to 900 pounds of seed cotton per acre more than other varieties in the same tests and grown under identical conditions of soil, fertilization and cultivation. This variation in yield has been no uncommon occurrence in our experience. Take, for instance, the results at the Edgecombe farm during the past eight years. In 1900, in a test of eight varieties, the difference between the variety yielding the largest amount of seed cotton per acre and the one the smallest was 565 pounds; in 1901 and 1902, in tests of seven varieties each, the differences were 530 and 790 pounds, respectively; in 1903, 663 pounds, when nine varieties were incorporated, 724 pounds in 1904 with twenty-one varieties, 576 pounds in 1905 with twenty-three varieties, 915 pounds in 1906 with twenty-six varieties, and 758 pounds in 1907 with twenty-seven varieties. The average of these differences is more than the average annual yield per acre of seed cotton in North Carolina. To grow cotton cheaply per pound, more must be produced per acre than is at present done on an average. To do this, better varieties must be planted, more thorough preparation and cultivation be given to the land, and more intelligent fertilization, either directly or indirectly, must be practiced. It costs no more to cultivate a prolific variety of cotton than one that has few bolls to the stalk or has a larger number of stalks missing in the row, due to imperfect germination of the seed, or some other avoidable or unavoidable cause.

WHAT A VARIETY SHOULD BE.

A variety of cotton should be a group of plants having some special excellencies, such as total yield of lint per acre, resistance to disease and insect pests, etc., and the seed of which should be able to transmit to their progeny, with certainty and without diminution, the excellent qualities of the parent plants. If the designated group of plants does not have these qualities, then it is not worthy to be styled a variety. Neither should the same variety have two names.

EARLY MATURING VARIETIES.

The earliest varieties, judged from the percentage of total cotton open at first picking in the past three or four years' tests at the test farms of the

Department, are Dozier's Improved, King's Improved, Hodge, Shine's Extra Early Prolific, and Webb. The first two named are probably the earliest maturing varieties we have thus far tested. They are especially adapted for growth in regions where cotton is liable to be cut off by frost, mattering not whether the prolonged growth be due to climate or soil.

MEDIUM-MATURING VARIETIES.

Culpepper's Improved, Cook's Improved, Excelsior Prolific, Peterkin's Improved, and Edgeworth are varieties that matured during the past year at a medium date.

LATE-MATURING VARIETIES.

Russell's Big Boll, Black Texas Wood, and Moss' Improved were the latest varieties tested. Some of these are good yielding varieties when grown where the season is long enough for complete development of their bolls before frost.

VARIETIES WITH HIGH PERCENTAGE OF LINT.

Of the varieties tested, Moss' Improved, King's Improved, Brown Texas Wood, Peterkin's Improved, Cook's Improved, Tool's Early Prolific, Hodge, Excelsior Prolific, Brown's No. 1, Edgeworth, and Mortgage Lifter are the ones that have yielded the highest percentage of lint to seed. With these varieties in 1904 the percentage of lint to seed varied from 35.42 per cent with Excelsior Prolific at the Edgecombe farm to 43.03 per cent with Moss' Improved at Iredell. The percentage yield of lint alone of a variety is frequently an unsafe guide in selecting a variety that will produce a large amount of lint cotton per acre.

VARIETIES WITH LARGE BOLLS.

Russell's Big Boll, Culpepper's Improved, Edgeworth, Double-header, and Brown's No. 1 are the five varieties thus far tested that possess the largest-sized bolls as well as seed. As an average of four years' tests at the Edgecombe farm and three years each at the Red Springs and Iredell farms, it has required the following number of bolls to yield a pound of seed cotton: Russell's Big Boll, at Edgecombe, 53; at Red Springs, 64, and at Iredell, 72. Culpepper's Improved, at Edgecombe, 60; at Red Springs, 71, and at Iredell, 74. Edgeworth, at Edgecombe, 66; at Red Springs, 77, and at Iredell, 79. These are late varieties and heavy producers of both lint and seed when planted upon soils that will mature them before frost.

VARIETIES ADAPTED TO THE EASTERN AND SOUTHEASTERN SECTIONS OF THE STATE.

After a study of our results with varieties obtained at the Edgecombe and Red Springs farms during the past six or seven years, it is found that of the varieties of cotton thus far tested, Excelsior Prolific, Edgeworth, Culpepper's Improved, King's Improved, Russell's Big Boll, and Peterkin's Improved have yielded the largest amounts of seed cotton per acre on an average. In the eastern part of the State, on the stiffer clayey soils, bottom lands, poorly drained lands and lands near the northern border of the State, it will generally be found advisable to use the best of the earlier maturing varieties, such as King's Improved, Edgeworth, and Excelsior Prolific; while on the more open, sandy and loamy soils of the east and southeast the larger-bolled and more vigorously growing varieties, such as Culpepper's Improved and Russell's Big Boll, will generally yield most satisfactory returns.

VARIETIES ADAPTED TO PIEDMONT SECTION OF THE STATE.

With reference to varieties of cotton suited to this portion of the State, we cannot assert with the same degree of certainty as we can for the eastern part of the State, as our experiments have only been conducted in Iredell for four years, and with some of the varieties for only the past season. So, with reference to this portion of the State, on a red-clay soil, we would recommend, tentatively, guided by our results, the use of either King's Improved, Culpepper's Improved, Edgeworth, or Excelsior Prolific as the best suited. King's Improved has, in our experiments at the Iredell farm, proved to be the earliest and decidedly the most prolific variety thus far tested there, where the growing season for cotton is comparatively short. There are other promising varieties being tested, but data for a sufficient number of years are not yet in hand to justify anything like definite statements in reference to them and their adaptability to different localities.

CORRELATION OF CHARACTERS OF VARIETIES OF COTTON.

With cotton, as with corn, it is of the highest importance for farmers, and imperative for all those who are studying or trying to improve varieties, to know what characters are usually antagonistic and what ones are mutually helpful in their economic development. In Table XII are compiled, in concise form, the results of four years' tests at Edgecombe, five at Iredell and two at Red Springs. From this compilation, supplemented by observation in the field and at the gin, the following tentative inferences are made in reference to the varieties of upland cotton tested, when grown under the conditions of climate and soil as represented by these three farms:

Antagonistic Characters.—(1) Earliness in maturity is not usually conducive to large yields, although in areas where a short growing period is afforded the earlier maturing varieties often give the greater yields (but these are not large generally), as is shown by King's Improved, which, during the past five years, has proven the most prolific of seed cotton at the Iredell farm, where the growing period for cotton during an average season is comparatively short. (2) Varieties that have large seed generally yield a small percentage of lint to seed. (3) Late-maturing varieties do not generally produce seed cotton that yields a high percentage of lint, although the number of pounds of lint per acre may be large. (4) Small-bolled varieties are not generally easily picked, and hence are unpopular with pickers.

Associated Characters.—(1) Varieties that mature early tend to the production of seed cotton that contains a high percentage of lint to seed. (2) Varieties with short staple usually have a high percentage of lint, and *vice versa.* (3) Varieties with large bolls generally have large seed and small percentage of lint. (4) The larger the yield of seed cotton per acre, through proper fertilization or favorable seasonal conditions, the lower the percentage of lint to seed, even of the same variety. (5) Good root and leaf development of a variety tends to increase power of resistance to drought, insect and disease ravages.

PROPER PLACE TO SELECT SEED.

With cotton, as with any other staple crop, the place to select seed for the next year's planting is in the field—selecting with reference to total yield of seed cotton, percentage of lint, date of maturity, vigor, hardiness, form and size of bolls, leaves, stalks, limbs, and resistance to disease and insect ravages.

By selecting from stalks that bear a large number of bolls per stalk, the tendency will be in the progeny to give an increased yield over the average of the patch, which is the seed obtained when one waits to secure his seed at random from the gin. Another objection to securing seed from the gin in the usual way is that it is usually deferred until late in the fall, and thereby, generally, seed from the last picking are obtained, which are not the best seed. The best seed, as a rule, are from the middle picking.

In selecting a variety one must not be guided entirely by total yield of seed cotton, for often between two varieties producing about the same quantity per acre the one with the smaller yield should be chosen because of its production of a larger amount of lint and higher selling price of total products (lint and seed). It should be remembered that lint sells for from eight to fifteen times as much per pound as seed.

Other things being equal, preference should be given to the larger-bolled varieties, with a large number of locks per boll, as they are much easier picked, and hence are most popular with pickers.

A few hours spent in the fall in selecting and gathering separately the seed cotton from stalks that have a large number of bolls well distributed over the stalks and with other desirable characters, will pay as well or better than any other form of farm work. The seed cotton thus gathered should be ginned separately and the seed carefully saved in some secure place for the next year's planting. Every one who has been through a cotton field in the fall has surely noticed the great difference in the same field, in the form, shape and number of bolls on different stalks, as well as in the characteristics of the stalks themselves. Now, remembering that the law of heredity is as strong and constant in plants as in animals will help to emphasize the great importance of selecting seed of the short-staple cotton only from those stalks that bear the largest amount of lint cotton per stalk. Of course, this latter statement does not apply to long-staple cottons in comparison with the short-staple ones, for a long-staple cotton may produce less lint per acre than a short-staple one, yet this smaller number of pounds may sell for more on the market, on account of its higher selling price per pound.

BUYING COTTON SEED.

Seed of cotton, as well as all other crops, should be purchased only from the most reliable sources, for frequently seeds advertised in extravagant superlatives are inferior. It is not always the cheapest seed that are secured for the smallest outlay; nor, on the other hand, are all expensive seed of superior quality; so the only safe plan to follow is to buy from the most reliable parties. It might be said, however, that if seed are properly selected they will have to bring a good price to compensate the seedsman or grower for his extra care and expense. The seed should possess strong vitality, for seed of low vitality produce a poor stand of stunted plants that do not produce as large yields as good seed when grown under identical conditions of soil, fertilization and cultivation. It will be remembered, however, that stunted cotton will give larger proportional yields than will corn. It is common to see cotton only a few inches high bearing one, two or more small bolls per stalk, while corn that only reaches three or four or five feet high will frequently produce not much more than a spindling stalk, small shuck and cob.

SOURCES OF VARIETIES OF COTTON TESTED.

The seed used in the variety tests of cotton at the Edgecombe and Iredell farms this year were received from the following sources:

Alexander Money-maker.....Alexander Seed Co., Augusta, Ga.
Bigham's Improved.....J. N. Bigham, R. F. D. No. 5, Charlotte, N. C.
Black Texas Wood.....Martin McKinnon, Red Springs, N. C.
Braswell's Cluster.....J. R. Pitt, Rocky Mount, N. C.
Brown's No. 1.....M. L. Brown, Decatur, Ga.
Cook's Improved.....J. R. Cook, Schley, Ga.
Culpepper's Reimproved.....J. E. Culpepper, Luthersville, Ga.
Cluster.....Martin McKinnon, Red Springs, N. C.
Cleveland's Big Boll.....J. R. Cleveland, Decatur, Ga.
Culpepper's Improved, Edgecombe Test Farm, Rocky Mt., N. C. (R. F. D. No. 5).
Dozier's Improved.....W. D. Dozier, Camden, N. C.
Drake's Defiance.....Drake Brothers, Philomath, Ga.
Edgeworth.....J. C. Little, Louisville, Ga.
Excelsior Prolific.....Excelsior Seed Farm, Cheraw, S. C.
Hodge.....C. N. Allen, Auburn, N. C.
King's Improved.....Iredell Test Farm, Statesville, N. C.
King's Improved (native).....J. W. Sherrill, Statesville, N. C.
Layton's Improved.....R. D. Layton, St. Matthews, S. C.
Mortgage Lifter.....H. G. Hastings & Co., Atlanta, Ga.
Moss' Improved.....B. D. Moss, Norway, S. C.
Morgan's Climax.....J. W. Morgan, Glendale, S. C.
Pullnot.....J. E. Bradbury, Athens, Ga.
Peterkin's Improved.....J. N. Peterkin, Fort Motte, S. C.
Russell's Big Boll...Edgecombe Test Farm, Rocky Mt., N. C. (R. F. D. No. 5).
Sugar Loaf.....C. S. Williams, Franklinton, N. C.
Shine's Extra Early Prolific.....J. A. Shine, Faison, N. C.
Simpkins' Prolific.....W. A. Simpkins, Raleigh, N. C.
Williams'.....C. S. Williams, Franklinton, N. C.
Webb.....Dr. C. L. Killibrew, Rocky Mount, N. C.
Wilson's Matchless.....F. D. Wilson, Littleton, N. C.

RESULTS OF DISTANCE TESTS OF COTTON.

These results are found in Tables XIII and XIV, which follow:

TABLE XIII—RESULTS OF DISTANCE TESTS OF COTTON.

IREDELL FARM—1907.

Rank According to Value of Total Products (Lint and Seed).	Distance Between Rows.	Distance Between Stalks in Rows.	Number Stalks per Plat.		Average Height of Stalks in Inches at Maturity.	Yield Seed Cotton in Pounds per Plat at the Several Pickings.				Yield Seed Cotton per Acre.	Pounds of Lint per Acre.	Pounds of Seed per Acre.	Value of Lint per Acre at 11 Cents per Pound.	Value of Seed per Acre at $1.00 per Hundred Pounds or 30 Cents per Bushel.	Total Value of Lint and Seed per Acre.
			For Perfect Stand.	By Actual Count.		First Picking—October 11.	Second Picking—October 29.	Third Picking—December 17.	Total Pickings.						
4	3½ feet	12 inches	651	495	36.0	20.00	13.50	10.50	44.00	880.00	333.7	546.3	$36.70	$ 5.46	$42.16
3	3½ feet	16 inches	489	511	36.0	21.50	14.00	13.50	49.00	980.00	371.6	608.4	40.87	6.08	46.95
5	3½ feet	20 inches	390	502	40.0	17.50	13.25	13.00	43.75	875.00	331.8	543.2	36.49	5.43	41.92
2	3½ feet	24 inches	324	488	40.0	25.00	18.00	13.50	56.50	1030.00	390.6	639.4	42.96	6.39	49.35
1	4 feet	12 inches	651	476	38.0	33.00	20.25	13.00	66.25	1093.12	415.5	678.6	45.70	6.79	52.49
6	4 feet	16 inches	489	442	38.0	22.00	15.50	14.25	51.75	853.87	323.8	530.1	35.61	5.30	40.90
8	4 feet	20 inches	390	353	40.0	14.00	12.50	12.00	38.50	635.25	240.9	394.4	26.49	3.94	30.43
7	4 feet	24 inches	327	368	40.0	23.00	13.00	10.00	46.00	759.00	287.8	471.2	31.65	4.71	36.36

Table XIV—COMPILED RESULTS OF DISTANCE TESTS OF COTTON.

EDGECOMBE FARM.

Year.	Yield Seed Cotton in Pounds per Acre at Different Distancing.								
	3¼ Feet by 12 Inches.	3½ Feet by 16 Inches.	3½ Feet by 20 Inches.	3½ Feet by 24 Inches.	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1901	1286.0	1384.0	1410.0	1063.0	964.0			893.0	
1903	1507.1	1507.1	1342.9	1342.9	1506.3		1331.1	1306.3	1312.5
1904	1541.2	1751.9	1632.4	1746.0	1723.3		1828.9	1646.6	1861.1
Averages	1444.7	1547.6	1461.7	1383.9	1397.8			1281.9	

Year.	3¼ Feet by 12 Inches.	3½ Feet by 16 Inches.	3½ Feet by 20 Inches.	3½ Feet by 24 Inches.	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1905	1593.8	1457.7	1214.2	1683.4	1896.7		2019.1	1577.1	1493.4

RED SPRINGS FARM.

Year.	3¼ Feet by 12 Inches.	3½ Feet by 16 Inches.	3½ Feet by 20 Inches.	3½ Feet by 24 Inches.	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1901	284.0	288.0	359.0	447.8	566.9		634.7		
1902	1258.6	1310.3	1340.5	1428.9	1229.3		1153.2	1051.4	1165.8
1903	831.8	897.2	906.5	757.0	883.1		997.6	842.2	727.7
Averages	791.4	831.7	868.6	877.9	893.1		928.5		

Year.	3¼ Feet by 12 Inches.	3½ Feet by 16 Inches.	3½ Feet by 20 Inches.	3½ Feet by 24 Inches.	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1904	857.5	750.0	675.0	860.0	767.5		815.0	727.5	622.5

TABLE XIV—COMPILED RESULTS OF DISTANCE TESTS OF COTTON—CON.

IREDELL FARM—1907.

Year.	3½ Feet by 12 Inches.	3½ Feet by 16 Inches.	3½ Feet by 20 Inches.	3½ Feet by 24 Inches.	4 Feet by 12 Inches.	4 Feet by 15 Inches.	4 Feet by 16 Inches.	4 Feet by 20 Inches.	4 Feet by 24 Inches.
1903	743.2	743.2	630.6	750.8	612.5	700.0	675.0	862.5	791.7
1904	845.0	795.0	810.0	835.0	845.8	.....	812.5	779.2	762.5
1905	975.0	1100.0	1035.0	1110.0	1340.0	.....	1280.0	1170.0	1325.0
1906	1190.0	1785.0	1585.0	1280.0	1215.3	.....	937.5	720.5	612.0
1907	880.0	980.0	875.0	1030.0	1093.1	.....	853.9	635.3	759.0
Averages	926.6	1080.6	987.1	1001.1	1021.3	.....	911.7	833.5	850.0

COMMENTS ON DISTANCE TESTS OF COTTON.

The average results of the distance tests conducted at the Edgecombe and Red Springs farms during the past four years indicate that the best distancing of cotton for the Edgecombe section is somewhere about 3½ feet by 16 inches, while at Red Springs it centers closely around 4 feet by 16 inches. As the average of five years' tests at the Iredell farm, the best distancing was 3⅓ feet by 16 inches.

The general deductions above should be accepted tentatively, as here, as with other tests, it will require a number of repetitions to arrive at a fair idea of the best width of rows and distance in rows for planting cotton on the types of soils on which these tests were made.

The plats at the four farms were arranged in lateral sizes, with each test occupying from three to five rows.

As the results of this test are likely to vary somewhat with different varieties, Culpepper's Improved seed were used at Red Springs, Russell's Big Boll at Edgecombe, and King's Improved[1] at Iredell.

In Table XIV is presented a summary of four years' tests at Edgecombe and at Red Springs, and five at Iredell.

III. FERTILIZATION AND CULTIVATION OF CORN AND COTTON.

CORN.

Culture.—It unquestionably pays well to thoroughly break and broadcast-harrow land for corn. Using a two-horse plow and running it 8 to 10 inches deep, and afterwards harrowing with large smoothing harrow, puts the land in nice condition. It is also well to run a small-tooth harrow or weeder across corn rows about the time the plants are coming up, and even after they are several inches high, slanting the teeth of the harrow backward. Harrowing in this way saves after-cultivation, and is a quick and comparatively inexpensive way of getting over the land. The land being thoroughly broken before the corn is put in the ground, only shallow, level cultivation with some one of the considerable number of good cultivators need be given the crop during the growing season. The one-horse cultivators cover corn rows in two or three furrows, and the two-horse ones at a single trip. The cultivation should be frequent—about every ten to twelve days—and, if possible, just after

[1]Culpepper's Improved was used in the test of 1903.

rains, so as to break any crust formed by showers, leaving a dust mulch to retard the loss of moisture added to the soil by previous rains. Toward the end of the growing season the cultivators should only be run one to one-and-a-half inches deep, so as to disturb as little as possible the roots of the plants, which, by that time, are well into the middle of the rows.

Fertilizers for Corn.—The experimental work on the sandy soils of the east, reports of which have been made previously, has progressed far enough, we feel, to draw some conclusions in reference to the best amounts and proportions of nitrogen, phosphoric acid and potash for corn. As the results of the past five years' work have not yet been published, the following formulas, based on the results of the first two years' tests, and tests in other States with similar soil and climatic conditions, are given as good ones for corn:

For Corn on Land in Fair Condition.

No. 1—

Acid phosphate, 14 per cent phosphoric acid	900 pounds
Cotton-seed meal, 6.59[2] per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	960 pounds
Kainit, 12.5 per cent potash	140 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.5 per cent; potash, 1.6 per cent; nitrogen, 3.2 per cent (equal to ammonia, 3.9 per cent).

No. 2—

Acid phosphate, 14 per cent phosphoric acid	1,045 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	520 pounds
Nitrate of soda, 15 per cent nitrogen	225 pounds
Kainit, 12.5 per cent potash	210 pounds
	2,000 pounds

In this formula one-half of the nitrogen is supplied by nitrate of soda and the other one-half by cotton-seed meal. This mixture will contain: available phosphoric acid, 8.0 per cent; potash, 1.7 per cent; nitrogen, 3.4 per cent (equal to ammonia, 4.0 per cent).

No. 3—

Acid phosphate, 14 per cent phosphoric acid	965 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	750 pounds
Nitrate of soda, 15 per cent nitrogen	110 pounds
Kainit, 12.5 per cent potash	175 pounds
	2,000 pounds

In this formula one-fourth of the nitrogen is supplied by nitrate of soda and the other three-fourths by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.7 per cent; potash, 1.7 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 4—

Acid phosphate, 16 per cent phosphoric acid	835 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	1,010 pounds
Kainit, 12.5 per cent potash	155 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.9 per cent; potash, 1.7 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

[2]6.59 per cent nitrogen equals 8 per cent ammonia.

No. 5—

Acid phosphate, 14 per cent phosphoric acid	860 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	850 pounds
Kainit, 12.5 per cent potash	290 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.6 per cent; potash, 1.8 per cent; nitrogen, 3.5 per cent (equal to ammonia, 4.3 per cent).

No. 6—

Acid phosphate, 16 per cent phosphoric acid	800 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	900 pounds
Kainit, 12.5 per cent potash	300 pounds
	2,000 pounds

This mixture is more concentrated than preceding ones, on account of the use of higher-grade materials, and will contain: available phosphoric acid, 9.1 per cent; potash, 1.9 per cent; nitrogen, 3.7 per cent (equal to ammonia, 4.5 per cent).

No. 7—

Acid phosphate, 14 per cent phosphoric acid	960 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	960 pounds
Muriate of potash, 50 per cent potash	80 pounds
	2,000 pounds

This mixture, too, is more concentrated than the preceding ones, on account of the use of a high-grade potassic material, muriate of potash, and will contain: available phosphoric acid, 9.6 per cent; potash, 2.0 per cent; nitrogen, 4.0 per cent (equal to ammonia, 4.8 per cent).

No. 8—

Acid phosphate, 14 per cent phosphoric acid	950 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	1,015 pounds
Muriate of potash, 50 per cent potash	35 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.9 per cent; potash, 1.6 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 9—

Acid phosphate, 16 per cent phosphoric acid	900 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	1,060 pounds
Muriate of potash, 50 per cent potash	40 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.5 per cent; potash, 1.8 per cent; nitrogen, 3.5 per cent (equal to ammonia, 4.3 per cent).

No. 10—

Acid phosphate, 14 per cent phosphoric acid	1,365 pounds
Dried blood, 13 per cent nitrogen	555 pounds
Muriate of potash, 50 per cent potash	80 pounds
	2,000 pounds

This mixture is a concentrated one, on account of high-grade nitrogenous

and potassic materials being used, and will contain: available phosphoric acid, 9.6 per cent; potash, 2.0 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

No. 11—	
Acid phosphate, 16 per cent phosphoric acid	1,310 pounds
Dried blood, 13 per cent nitrogen	600 pounds
Muriate of potash, 50 per cent potash	90 pounds
	2,000 pounds

This mixture is quite concentrated, on account of the high-grade phosphatic and potassic materials used, and will contain: available phosphoric acid, 10.5 per cent; potash, 2.3 per cent; nitrogen, 3.9 per cent (equal to ammonia, 4.7 per cent).

No. 12—	
Bone meal, 22.5 per cent phosphoric acid and 3.7 per cent nitrogen	950 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	975 pounds
Muriate of potash, 50 per cent potash	75 pounds
	2,000 pounds

This mixture is a concentrated one, on account of the high-grade phosphatic and potassic materials used, and will contain: available phosphoric acid, 11.9 per cent; potash, 2.6 per cent; nitrogen, 5.0 per cent (equal to ammonia, 6.0 per cent).

No. 13—	
Acid phosphate, 14 per cent phosphoric acid	585 pounds
Cotton seed, 3.1 per cent nitrogen, 1.3 per cent phosphoric acid and 1.2 per cent potash	1,375 pounds
Kainit, 12.5 per cent potash	40 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 5.0 per cent; potash, 1.1 per cent; nitrogen, 2.1 per cent (equal to ammonia, 2.6 per cent).

Cotton Seed.—Cotton seed may replace the meal in preceding formulas containing meal by allowing 2 pounds of seed for one of meal.

Nitrate of Soda.—This material is quick-acting, because of its easy solubility in water. For this reason, when used in a considerable quantity in fertilizers at time of planting, especially on light sandy land, there is considerable danger of its being leached beyond the reach of the roots of the plants before they can use it. On clay lands and loams having good subsoils to them this danger does not exist, certainly not to the extent that it does on light soils. A small amount of nitrate of soda in the mixture will give the crop a quick start and make its cultivation easier and more economical. Formula No. 3 has been arranged with this idea in view, and in No. 2 one-half the nitrogen comes from nitrate of soda. On light lands it would likely be better to omit the nitrate from the mixture and apply it as a top dressing, between the 10th and last of June, on early corn. Nitrate of soda may take the place of a portion of the other nitrogen-furnishing materials in any of the formulas, one pound of nitrate being equal in its content of nitrogen to 2.2 pounds of cotton-seed meal, 2 pounds of fish scrap, 1.2 pounds of dried blood. Nitrate of soda is frequently used as a top dressing for corn, and is a very valuable material for use in this way. A good application is 50 to 75 pounds per acre, distributed along the

side of the row or dropped beside the plants and three or four inches from them, or else, where there is a ridge in the center, it may be distributed on this, and when it is thrown out the nitrate will be thrown to the two sides of the row.

Application of Fertilizers to Corn.—On clay lands and loams having good subsoil the fertilizer should be applied in the drill, at or just before planting, at the rate of 200 to 400 pounds per acre. On light sandy lands it is best to use 50 to 100 pounds in the drill at time of planting, to give the crop a good start, and the balance of the fertilizer as a side dressing when the corn has begun to grow well.

Fertilizers for Corn Following Peas and Other Legumes.

The best and most profitable yields of corn in our experimental work were where the corn followed velvet beans, bur clover, cowpeas, crimson clover and other leguminous crops. These crops, with acid phosphate and kainit, or some other potash salt, are the best previous treatment and fertilization for corn. Where light crops of peas have been grown in corn, or cut from the land and the stubble left, it would be safest to add some nitrogenous material in the fertilizer mixture. In cases of this kind it is suggested that the nitrogen-furnishing material in any of the preceding formulas be reduced one-half. Where corn is to follow good crops of velvet beans, peas, bur and crimson clover or soja beans, especially where the entire crops have been left on the soil, no further application of nitrogen need be made, but it is advised that 200 to 300 pounds per acre of the following mixture, in the drill, be used just before planting:

Acid phosphate	200 pounds
Kainit	100 pounds

COTTON.

Culture.—The remarks regarding the preparation and cultivation of corn also apply with equal force to cotton, unless it be the part regarding breaking the land well before planting. Some doubt the necessity of this for cotton. Cotton is generally grown on ridges. This is necessary on wet soils, but on all fairly well-drained upland and sandy soils we are convinced that level and frequent shallow cultivation, as was indicated for corn, is the best and most economical method to follow in growing cotton. Ridge culture may give better results in very wet years, but, taking the seasons as they come, the advantage will lie, we think, with flat culture.

Fertilizers for Cotton.—The preliminary remarks regarding fertilizers for corn also apply to cotton, the following formulas being offered tentatively and as the result of our best judgment, after studying the best obtainable data on this subject:

For Cotton on Land in Fair Condition.

No. 1—

Acid phosphate, 14 per cent phosphoric acid	895 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	790 pounds
Kainit, 12.5 per cent potash	315 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 2.6 per cent; nitrogen, 2.6 per cent (equal to ammonia, 3.2 per cent).

No. 2—

Acid phosphate, 14 per cent phosphoric acid	1,015 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	415 pounds
Nitrate of soda, 15 per cent nitrogen	180 pounds
Kainit, 12.5 per cent potash	390 pounds
	2,000 pounds

In this formula one-half of the nitrogen is supplied by nitrate of soda and the other one-half by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.6 per cent; potash, 2.7 per cent; nitrogen, 2.7 per cent (equal to ammonia, 3.3 per cent).

No. 3—

Acid phosphate, 14 per cent phosphoric acid	955 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	605 pounds
Nitrate of soda, 15 per cent nitrogen	90 pounds
Kainit, 12.5 per cent potash	350 pounds
	2,000 pounds

In this formula one-fourth of the nitrogen is supplied by nitrate of soda and the other three-fourths by cotton-seed meal. This mixture will contain: available phosphoric acid, 7.4 per cent; potash, 2.6 per cent; nitrogen, 2.6 per cent (equal to ammonia, 3.1 per cent).

No. 4—

Acid phosphate, 16 per cent phosphoric acid	830 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	830 pounds
Kainit, 12.5 per cent potash	340 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.7 per cent; potash, 2.7 per cent; nitrogen, 2.7 per cent (equal to ammonia, 3.3 per cent).

No. 5—

Acid phosphate, 14 per cent phosphoric acid	850 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	690 pounds
Kainit, 12.5 per cent potash	460 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.0 per cent; potash, 2.9 per cent; nitrogen, 2.9 per cent (equal to ammonia, 3.5 per cent).

No. 6—

Acid phosphate, 16 per cent phosphoric acid	790 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	730 pounds
Kainit, 12.5 per cent potash	480 pounds
	2,000 pounds

This mixture is more concentrated than the foregoing ones, on account of the higher-grade materials used, and will contain: available phosphoric acid, 8.5 per cent; potash, 3.0 per cent; nitrogen, 3.0 per cent (equal to ammonia, 3.6 per cent).

No. 7—

Acid phosphate, 14 per cent phosphoric acid	1,020 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	890 pounds
Muriate of potash, 50 per cent potash	90 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 8.3 per cent; potash, 2.9 per cent; nitrogen, 2.9 per cent (equal to ammonia, 3.5 per cent).

No. 8—

Acid phosphate, 16 per cent phosphoric acid	965 pounds
Cotton-seed meal, 6.59 per cent nitrogen, 2.5 per cent phosphoric acid and 1.5 per cent potash	940 pounds
Muriate of potash, 50 per cent potash	95 pounds
	2,000 pounds

This mixture is a concentrated one, on account of the high-grade phosphatic and potassic materials used, and will contain: available phosphoric acid, 8.9 per cent; potash, 3.1 per cent; nitrogen, 3.1 per cent (equal to ammonia, 3.8 per cent).

No. 9—

Acid phosphate, 14 per cent phosphoric acid	1,045 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	820 pounds
Muriate of potash, 50 per cent potash	135 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 9.8 per cent; potash, 3.4 per cent; nitrogen, 3.4 per cent (equal to ammonia, 4.1 per cent).

No. 10—

Acid phosphate, 16 per cent phosphoric acid	975 pounds
Fish scrap, 8.25 per cent nitrogen and 6.0 per cent phosphoric acid	880 pounds
Muriate of potash, 50 per cent potash	145 pounds
	2,000 pounds

This mixture is considerably more concentrated than the others, on account of the high-grade materials used, and will contain: available phosphoric acid, 10.4 per cent; potash, 3.6 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

No. 11—

Acid phosphate, 14 per cent phosphoric acid	1,355 pounds
Dried blood, 13 per cent nitrogen	510 pounds
Muriate of potash, 50 per cent potash	135 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 9.5 per cent; potash, 3.4 per cent; nitrogen, 3.3 per cent (equal to ammonia, 4.0 per cent).

No. 12—

Acid phosphate, 16 per cent phosphoric acid	1,295 pounds
Dried blood, 13 per cent nitrogen	560 pounds
Muriate of potash, 50 per cent potash	145 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 10.4 per cent; potash, 3.6 per cent; nitrogen, 3.6 per cent (equal to ammonia, 4.4 per cent).

No. 13—	
Acid phosphate, 14 per cent phosphoric acid	630 pounds
Cotton seed, 3.1 per cent nitrogen, 1.3 per cent phosphoric acid and 1.2 per cent potash	1,190 pounds
Kainit, 12.5 per cent potash	180 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 5.2 per cent; potash, 1.8 per cent; nitrogen, 1.8 per cent (equal to ammonia, 2.2 per cent).

Cotton Seed and Nitrate of Soda.—The remarks under "Corn" regarding these two fertilizing materials apply also to cotton, as do the suggestions concerning the change in the quantity of nitrogen-supplying materials in the formulas, should cotton follow peas or any other leguminous crop. In Formula No. 3 one-fourth of the nitrogen is supplied by nitrate of soda, with the view of giving the crop a quick start, and in No. 2 one-half of the nitrogen comes from this source. On light lands it will be good practice to omit this nitrate from the mixture and apply it as a side dressing about the middle of June. Good results come from the use of it in this way on heavy types of land. Where land does not produce a good stalk of cotton, and fertilizers are used which contain only a moderate amount of nitrogen or ammonia, good results are obtained from a side dressing of 50 to 100 pounds of nitrate of soda per acre. The nitrate should be distributed along one side of the row, or, where there is a ridge in the middle, it may be put on this, and when the ridge is thrown out the nitrate will be thrown on two sides of the row.

Application of Fertilizer to Cotton.—The fertilizer should be applied in the drill at or just before planting. The quantity used for cotton varies from 200 to 1,000 pounds per acre; 400 to 600 are the more common quantities used of the grade of Formula No. 1. Some of the mixtures mentioned are much more concentrated than No. 1, and when they are used the quantity may be reduced proportionately.

IV. Composts and Composting.

Compost for General Use.—Frequent requests are made for compost formulas, and the following one, with barnyard manure, rich dirt, or woods mould, or all, and acid phosphate and kainit, is well suited for general use:

Barnyard manure, rich dirt or woods mould	1,750 pounds
Acid phosphate	200 pounds
Kainit	50 pounds
	2,000 pounds

With average barnyard manure the above compost would contain: phosphoric acid, 1.7 per cent; potash, .7 per cent; and ammonia, .6 per cent. One ton of this compost is worth between 500 and 600 pounds of the average fertilizer containing 8 per cent of available phosphoric acid, 2 per cent of potash and 2 per cent of ammonia. It should be applied at the rate of 600 to 1,600 pounds per acre in the drill, 1,400 pounds of the compost being about equal to an application of 400 pounds of the 8-2-2 fertilizer.

The compost may be made under shelter or out of doors. In either case select a place where the soil is compact, and arrange it so that the water that may run through the heap will not drain from it. Put down the materials in alternate layers—first, a layer 3 to 6 inches thick, according to the size of

the compost to be made, of the manure, woods mould or rich dirt, then sprinkle upon this layers of acid phosphate and kainit, and continue in this way to put down alternate layers of the materials till the compost is complete. If dry, the manure, mould, etc., should be moistened by sprinkling with water, and the heap should be brought to a conical or wedge shape, covered with dirt, preferably rich dirt, and thoroughly compacted to prevent undue entrance of air, which brings about heating and injurious fermentation of the heap. The compost must be watched, and if it becomes hot a hole should be made in the side and towards the top and water poured in to cool it. Heating is likely to occur if made under shelter, while if made out of doors in the winter and early spring the rains are apt to be sufficient to keep it moist, but here there is danger of loss, especially of the very soluble potash and phosphoric acid, from leaching, and the heaps made out of doors need careful watching to see that they do not get too hot just after making and between rains, and more especially to see that they are thoroughly covered with dirt and compacted, so as to make the water run mostly off the sides instead of through the heap and draining off with the most valuable part of the manure. The heap should remain 40 to 60 days, and may stay longer. Before using, it should be thoroughly cut up and mixed by means of hoes and shovels. If the manure, woods mould and dirt are reasonably free from litter and trash, the mixture may be put through a sand screen and be in condition to drill as other fertilizers are. This will require care in selecting the manure, mould and dirt.

Unquestionably, there is great advantage, if it is not, indeed, an absolute necessity, to save scrupulously all the manure and other waste material on and around the farm to assist in maintaining or increasing its productiveness. One way to do this is to use the compost in some way similar to that suggested in the foregoing. Another and perhaps somewhat cheaper way, unless the compost is made at a time when the farm labor is not profitably occupied with other work, is to apply the manure and woods mould, etc., broadcast where there are large quantities of them, or in the drill when the amounts are limited and less than 1,500 to 2,000 pounds to the acre, and drill the acid phosphate and kainit or other materials on them. This saves the cost of mixing. Each plan has its advantages, and each farmer can decide for himself which best suits his individual case and which will enable him to save to best advantage these exceedingly important and valuable fertilizer materials on and about the farm, and which go to waste, or partial waste, in far too many instances.

Compost with Cotton Seed.—Frequently cotton seed are used as a fertilizer. One difficulty in the way of their use is the killing of the germs of the seed so as to prevent them from sprouting and growing. A common custom is to pile the seed in the field early in the spring and allow them to become wet and afterwards heat. They are then put in the drill as other fertilizers, or sometimes broadcast. They are also killed by composting, and the following compost with cotton seed is a well-balanced and rich one for general farm crops:

Acid phosphate	300 pounds
Cotton seed, 13½ bushels	400 pounds
Kainit	75 pounds
Barnyard manure, etc	1,225 pounds
	2,000 pounds

This compost will contain: phosphoric acid, 2.6 per cent; potash, .9 per cent; ammonia, 1.1 per cent. One ton of it is worth between 800 and 900 pounds of the average fertilizer containing 8 per cent available phosphoric acid, 2 per

cent ammonia and 2 per cent potash, and a good application for cotton would be 600 to 1,200 pounds in the drill, and for corn 400 to 800 pounds in the drill.

Compost with Cotton-seed Meal.—Cotton-seed meal may replace the seed in the preceding compost. In fact, it is much better to use some of the insoluble forms of nitrogen or ammonia in composts rather than nitrate of soda or sulphate of ammonia, which are already in easily soluble condition and ready to feed plants. Besides, there is not the same danger of loss when materials like cotton seed, cotton-seed meal, etc., are used as when nitrate of soda and sulphate of ammonia are employed. The following compost with cotton-seed meal is some richer than the one with seed given above:

Acid phosphate	325 pounds
Cotton-seed meal	200 pounds
Kainit	100 pounds
Barnyard manure, etc.	1,375 pounds
	2,000 pounds

This mixture will contain: phosphoric acid, 2.8 per cent; potash, 1.0 per cent; ammonia, 1.2 per cent. One ton of this is equal in fertilizing value to about one-half ton of a mixed fertilizer containing 8 per cent available phosphoric acid, 2 per cent ammonia and 2 per cent potash. A good application of it for cotton would be 400 to 800 pounds in the drill, and for corn 300 to 600 pounds in the drill.

Use Lime in the Compost.—Where lime is used at all in the making of compost, it should not be put in contact with either the barnyard manure or acid phosphate, as it has an injurious action on both of these, endangering the loss of ammonia from the manure by setting it free and enabling it to pass off in the air, and changing the phosphoric acid of the acid phosphate into an insoluble form. Where sour muck or black soil is used, the lime mixed with these would correct their acidity or sourness and prove beneficial.

V. Fertilizers for Tobacco.

There are few products whose quality and quantity are more affected by the kind of soil and fertilizer used than is tobacco. For bright tobacco, the main kind grown in this State, the fine and deep, sandy loam with yellow-colored sandy clay subsoil is the type of land most largely used, and the one which grows the best grade of this character of tobacco. Generally, the kind of soil that is suited to the production of tobacco is better understood than the fertilizer that should be used on it. Evidence of this is seen in the great variation in the composition of fertilizers sold in the State, especially for use on the tobacco crop. In 1901 there were registered with the Department of Agriculture one hundred and eight (108) special fertilizers for tobacco. It is interesting in this connection to note the wide variation as well as the average composition of these fertilizers. The highest amount of available phosphoric acid guaranteed in any of them was 9.25 per cent, the lowest 5 per cent, and the average 8.12 per cent. The highest amount of ammonia guaranteed was 10 per cent, the lowest 2 per cent, and the average 2.73 per cent. The highest amount of potash guaranteed was 5 per cent, the lowest 1 per cent, and the average 2.64 per cent. These wide variations in the amounts of the valuable fertilizing constituents indicate that the fertilizers themselves must have had very varying effects on the quality and quantity of the tobacco crop.

A study of the experiments in tobacco growing, and a consideration of the experiences of good tobacco growers, show that the amounts of ammonia and potash in the average tobacco fertilizers, as stated above, are not as large as are needed to give the best results. It would appear that the largest amount of ammonia (10 per cent) in any of these "specials" is greater than is required for bright tobacco, while the maximum quantity of potash (5 per cent) in any of the 108 brands is less than is used by numbers of our best bright tobacco growers, especially in the eastern part of the State. A considerable number of these growers either mix their own tobacco fertilizers or else have them put up according to formulas of their suggestion. Below are given eight formulas for mixing fertilizers for tobacco. The grade of these fertilizers will be higher and they will, of course, cost more than the goods that are generally used in the State on tobacco, but we feel confident that the increased yield will more than justify the additional expense. In THE BULLETIN of the Department of Agriculture, and in our correspondence with farmers, we have been recommending formulas of about the composition of these for a number of years, and evidence is accumulating which shows that the character of tobacco fertilizers is undergoing quite a considerable change.

No. 1—

Acid phosphate, 14 per cent	750 pounds
Cotton-seed meal	900 pounds
Nitrate of soda	100 pounds
Sulphate of potash, high grade	250 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 6.3 per cent; potash, 6.9 per cent; nitrogen, 3.7 per cent (equal to ammonia, 4.5 per cent).

No. 2—

Acid phosphate	1,065 pounds
Dried blood, high grade	500 pounds
Nitrate of soda	125 pounds
Sulphate of potash, high grade	310 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.4 per cent; potash, 7.7 per cent; nitrogen, 4.3 per cent (equal to ammonia, 5.2 per cent).

No. 3—

Acid phosphate	875 pounds
Fish scrap	725 pounds
Nitrate of soda	100 pounds
Sulphate of potash, high grade	300 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 7.5 per cent; nitrogen, 3.8 per cent (equal to ammonia, 4.6 per cent).

No. 4—

Acid phosphate	1,000 pounds
Dried blood	500 pounds
Nitrate of soda	100 pounds
Sulphate of potash, high grade	400 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7 per cent; potash, 10 per cent; nitrogen, 4.1 per cent (equal to ammonia, 5 per cent).

No. 5—

Acid phosphate	900 pounds
Cotton-seed meal	700 pounds
Nitrate of soda	100 pounds
Sulphate of potash, high grade	300 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 7.2 per cent; potash, 7.7 per cent; nitrogen, 3.1 per cent (equal to ammonia, 3.8 per cent).

No. 6—

Acid phosphate	745 pounds
Cotton-seed meal	1,140 pounds
Sulphate of potash, high grade	115 pounds
	2,000 pounds

This mixture will contain: available phosphoric acid, 6.6 per cent; potash, 3.7 per cent; nitrogen, 3.8 per cent (equal to ammonia, 4.6 per cent).

No. 7—

Acid phosphate	885 pounds
Dried blood	575 pounds
Nitrate of soda	170 pounds
Sulphate of potash, high grade	370 pounds
	2,000 pounds

In this formula one-fourth of the nitrogen is derived from nitrate of soda and the other three-fourths from dried blood. This mixture will contain: available phosphoric acid, 6.2 per cent; potash, 9.2 per cent; nitrogen, 5.2 per cent (equal to ammonia, 6.2 per cent).

No. 8—

Acid phosphate	874 pounds
Cotton-seed meal	782 pounds
Nitrate of soda	116 pounds
Sulphate of potash, high grade	228 pounds
	2,000 pounds

In this formula one-fourth of the nitrogen is derived from nitrate of soda, and the other three-fourths from cotton-seed meal. This mixture will contain: available phosphoric acid, 4.2 per cent; potash, 6.3 per cent; nitrogen, 4.2 per cent (equal to ammonia, 5.1 per cent).

Five hundred and seventy-five pounds of No. 8 is equivalent to 600 pounds of a mixture analyzing 4 per cent available phosphoric acid, 6 per cent potash and 4 per cent ammonia.

Three hundred and fifty to one thousand pounds of these mixtures should be used to the acre.

The mixtures made from Formulas Nos. 2 and 3 are somewhat more concentrated than that from No. 1, on account of cotton-seed meal containing less ammonia than fish scrap and dried blood. The three formulas are given to enable the use of any one of the three main organic nitrogenous materials—dried blood, fish scrap and cotton-seed meal. In the coastal sections fish scrap and meal are both easily obtained; some distance inland meal is more accessible, while in the more western end of the tobacco belt it will be found convenient to use dried blood. All three are good sources of ammonia for tobacco. The other materials—nitrate of soda, sulphate of potash, and acid phosphate—are the same for all mixtures.

Occasional requests are made for formulas furnishing as much as 10 per cent of potash, and No. 4 has been arranged to meet needs of this nature. It is known that excellent tobacco, in quality and quantity, is grown by the use of fertilizers of this class, and some of our farmers greatly prefer them to others containing less potash. It takes considerable observation and experimentation to determine the best practice in matters of this kind.

Formula No. 7, in 1905, in some tobacco experiments conducted on the bright-leaf soils of Granville County, gave very promising results. Three hundred and eighty-eight pounds per acre of this mixture were used, which was equal to an application of 600 pounds of a mixture analyzing 4 per cent available phosphoric acid, 6 per cent potash and 4 per cent ammonia.

A limited quantity of stable manure is very beneficial to tobacco, and it succeeds well after peanuts. These materials add ammonia to the soil, and where heavy applications of fertilizers are to be made in connection with manure, and on peanut land, it would be well not to have so much ammonia in the fertilizers as is used in the ones employed on land not having other ammoniated materials put on them. Formula No. 5 is destined to meet cases of this kind. A good many eastern tobacco growers plant tobacco after peanuts, and some of them grow peas between the hills of tobacco, planting them with hoes and putting six to ten peas in a place, the latter part of June or early in July. This improves the soil for after-crops, but tobacco grown after tobacco and peas is said not to be of good quality, though, as would be expected, the growth is very large.

Good results will come from the use of high-grade fertilizers, such as are suggested above, or similar ones, and we believe that when once tried there will be no inclination to go back to the lower-grade ones, now so largely used.

FARM DEMONSTRATION WORK.

Within recent years there has been inaugurated a method of extending agricultural knowledge known as *Agricultural Demonstration.* The purpose of this new educational work is not to displace or supplant any of the other established means of increasing and extending agricultural information, such as the Agricultural College, the Agricultural Experiment Stations and the Farmers' Institutes; but it is intended to supplement and assist all other means of bringing the actual tillers of the soil closer to those agricultural facts ascertained by the Experiment Stations and accumulated through long years of experience.

This demonstration method of teaching established agricultural facts to the farmer by operations on his own farm is but another evidence of the present tendencies of scientific methods of teaching. It is the approved modern laboratory method of instruction taken to the individual farm.

The operations already being conducted on the farm are used to demonstrate the value of a knowledge of the few general scientific principles underlying up-to-date farm practices, and that these practices are applicable to and of great value to this particular farm. With *farm crops* the value of better seed and more intelligent fertilization and of better preparation and cultivation of the land are demonstrated. In *fruit growing* the increase in the quantity and quality of the product resulting from better methods of orchard management and the value of more attention to preparing the fruit for market are shown. In *dairying* the unprofitable cows are detected, better methods of care and feeding put in operation, and the greater profits from placing a high-class product on the market proved.

The general method of conducting this farm demonstration work is to send a practical man, having a working knowledge of scientific agriculture and an intimate experience with the special line of work he has in charge, to the farms of the men who are to co-operate in carrying out the demonstration. These visits are made at regular intervals during the period of the demonstrations, in order to make certain that the farmer shall have such instruction and assistance as he may need in performing his part of the work.

When the demonstrator goes to a farm he endeavors to utilize such facilities as already exist there or may easily be obtained. No experiments are undertaken, but only such crops and practices as the value of which have been thoroughly demonstrated are advised. In short, it is demonstration and not experimental work that is contemplated.

The chief obstacle to progress and the introduction of improved methods and implements is that old practices are more easily and perfectly executed because of long practice in following them. A new practice, although in itself much more easily followed and, when well performed, much more effective, may at first be more difficult than the old way, and, for this reason, being less perfectly performed, may be less effective. The personal presence and assistance of the demonstrator in starting new methods and implements of known value removes this obstacle to their introduction and insures them a fair trial, which may lead to their permanent use in future farming operations.

The aim of this demonstration work is simply to assist the farmer to introduce such farm practices as have been proved of value, and thereby enable him to do better farming and get more for his labor. Incidentally, the farmer also obtains much valuable agricultural information.

With the full inauguration of this farm demonstration work the connection between the farmer and agricultural science will be complete. We have the Experiment Stations to verify old and ascertain new facts; the Agricultural Colleges to teach these facts to the few who go to college, and these few to teach the masses, through the medium of the Farmers' Institute, and show the accuracy of their teaching by means of farm demonstration.

So fully impressed was the State Department of Agriculture with the importance of the work and its possibilities for direct good to agriculture, that, in September, 1907, a division of *Demonstration* was created and Mr. T. B. Parker elected to take charge of this important line of work.

If the fruit growers, truckers, dairymen or general farmers of any section or any individual desires assistance in any line of farm work, the State Department of Agriculture will be glad to co-operate with him and render all assistance possible to enable him to obtain better results from his labor, and, when necessary, a representative from the Department will visit any part of the State and assist in overcoming any agricultural difficulties encountered.

DEMONSTRATION WORK AS APPLIED TO FARM CROPS.

By T. B. Parker, in Charge of Demonstration Work.

So far, in North Carolina, demonstration work relating to farm crops has been confined to alfalfa, crimson clover, vetches, and improved varieties of corn and cotton. It was started about two years ago with alfalfa, in co-operation with the United States Department of Agriculture.

Through this co-operation effected with the Federal Department of Agriculture, we were last year able to send crimson clover and vetch to nearly seventy-five farmers living in more than twenty-five counties and embracing nearly every section of the State. These seed are not distributed indiscriminately. They are sent out for the specific purpose of finding out where they will succeed and under what conditions they do best, and to prove to the farmers their economic agricultural value. Each person receiving seed will also be required to keep a record of time of planting, the nature of the land, what crop occupied the land last year, if high land or low land, level land or hill land, the methods of cultivation, fertilization, etc., for which we furnish blanks to be filled out by the co-operator. With this data, covering every variety of soil in the State, different methods of cultivation, fertilization, etc., we can draw conclusions that must be helpful to the agricultural interests of the State. Follow this up a few years, until we have proved by the test of time the results of these farm tests, and we will have a fund of information that will be invaluable to the farmers of the State.

The value of alfalfa as a forage crop, as well as a soil improver, wherever it can be grown, is sufficient reason for the Department of Agriculture to encourage its cultivation, which we are doing on small areas in many parts of the State.

Crimson clover is another of the legumes that we are anxious to see grown all over the State, especially where red clover will not succeed. The Department feels justified in inducing our farmers to grow this crop. It is not only a fine soil improver, but is also a good hay plant.

The vetches also belong to the legume family and are valuable for soil improvement and for hay.

The great value of these plants has been proven at our test farms, and we are desirous of demonstrating to the farmers their value along these lines.

But few reports have as yet come in, but those that have are of a very encouraging nature and give evidence of an interest in these crops. We have not yet been able to make any definite arrangements in regard to crimson clover and vetch to send out again this fall, but we are hoping to be able to send out even more than we did last season.

In addition to the above-named crops, the Division of Demonstration Work has this year (1908) sent improved seed corn to about 175 co-operators, and improved cotton seed to about an equal number, embracing every section of the State in which cotton is produced in appreciable quantities. Besides, in four counties we are co-operating with Dr. S. A. Knapp, of the United States Department of Agriculture, in demonstration work, the State Department of Agriculture furnishing the seed and Dr. Knapp the demonstrators.

With this nucleus of workers, demonstrators and co-operators scattered all over the State, we are expecting reports that will justify an extension of the work until every county in the State will be occupied.

It has been demonstrated at our test farms that the highest yielding variety of corn will produce almost twice as much corn per acre as the lowest yielding variety tested. Likewise with cotton. At the Edgecombe Test Farm last year (1907) the best yielding variety of cotton produced $57.71 worth of lint and seed, while the lowest yielding variety tested produced only $24.25 worth of lint and seed. If we can introduce the best variety of either corn or cotton in the field of a farmer who is planting the lowest yielding varieties, and let him compare the different varieties, he at once becomes a convert to improved seed. If it were possible to do this on every farm in the State, we would raise the yield per acre for both of these crops to a point that would mean a very greatly increased profit. But the Department of Agriculture cannot do these things alone. It must have the co-operation of the farmers. We are willing to send the seed as long as our supply will permit, and give any instructions or other information at our command, and the co-operators must do the balance.

We would like to have in this work as co-operators farmers who really believe there is a future for the farmers and who believe better seed and better methods of preparation and cultivation will result in increased yields, and who will be willing to keep a record of the work and report results for the benefit of his fellow farmer. We should be glad to correspond with those who are interested to this extent.

The field of demonstration work, or co-operative experiments, is wide and freighted with great possibilities. With the full and hearty co-operation of the State Department of Agriculture and the progressive farmers of the State, our crop yields can be made much larger and farm life much more enjoyable.

ORCHARD DEMONSTRATIONS.

By W. N. Hutt, Horticulturist.

During February, 1908, several orchard demonstration institutes were held in the apple-growing regions of the State to show the best methods of pruning and spraying fruit trees. The meetings were held right out in the orchards, where the demonstrators could actually do the work and have the trees to illustrate what they were talking about.

The orchards in which the demonstrations were given were selected beforehand, on account of convenient and central location. The trees used in the demonstration were generally near a road, where they could be under observation throughout the season, so that the results of the demonstration could be noted.

Demonstrations were given in the following counties: Stokes, Surry, Alexander, Wilkes, Caldwell, Watauga, Henderson, Haywood, Jackson and Swain.

PRUNING.

The demonstration of pruning proceeded about as follows:

1. The fruit growers present were taken through the orchard, and the best forms of trees for commercial orcharding were noted.
2. Those present picked out a tree which they desired to see pruned.
3. The demonstrator outlined the method of growth in trees and explained the reasons for pruning.
4. The origin of fruit buds and their development were explained.
5. Pruning tools of different kinds were shown and their uses explained by the demonstrator.
6. The tree was pruned and the principles of pruning and the why and wherefore of each step explained while the work was being done.
7. The pruned and unpruned trees were compared.
8. How to properly remove a limb and treat the resulting wound was demonstrated.
9. Different kinds of trees were pruned. For example, apple, pear, peach, plum, etc.
10. The pruning and training of a young tree was explained and demonstrated.
11. Methods of renovating old and neglected trees were shown.
12. Tools were distributed to those present and trees were pruned by them, under the direction of the demonstrator.
13. A general discussion of the subject of pruning followed these demonstrations, and questions were freely asked and answered.

FUTURE DEMONSTRATIONS.

The coming fall it is purposed to visit the same orchards in which the pruning and spraying demonstrations were given this spring, and to call the orchardists together to note the results of the work done at the spring demonstration in improving the quality and increasing the quantity of fruit. It is the further purpose to pick this fruit and to demonstrate the most approved

methods of commercial grading and packing of fruit for the wholesale market. By these demonstrations it is hoped to assist our fruit growers to make use of our splendid natural facilities and to encourage them in the development of a great commercial fruit industry.

SPRAYING DEMONSTRATIONS.

By Franklin Sherman, Jr., Entomologist.

At the conclusion of the pruning work described in the preceding pages a demonstration was given of the spraying of fruit trees, to prevent damage by insects and diseases, and to improve the quality of the fruit. The general method followed was similar to that of the pruning demonstration, and the trees which had already been pruned were used in the spraying demonstration.

1. A brief account was given of the most serious orchard insects which are combated by spraying, and when present these were pointed out in their actual natural location on the trees.

2. A complete barrel-spraying outfit for commercial orchards and a complete bucket outfit for family orchards were exhibited, explained and put together, ready for work.

3. The manner of measuring out and dissolving the ingredients for making the *Bordeaux Mixture and Paris Green* was explained and the mixtures prepared before the audience.

4. The trees were thoroughly sprayed, the process being fully explained in every detail. Members of the audience were encouraged to take part in the work.

5. Different nozzles and extension rods were used to show their adaptability to different uses.

6. A general discussion of the subject of spraying followed, with the asking and answering of questions.

Twice during the growing season a representative from this office has gone to these orchards again, each time giving another application of the same spraying mixture.

It would be very desirable to give more demonstrations of this kind in the future, not only in the western counties, but in the piedmont and eastern sections as well—particularly in counties where fruit is grown for distant shipment or to supply local markets, and where the methods of spraying are not now well understood.

Demonstrations of similar character and using the same mixture should be made with other crops, especially Irish potatoes, grapes and melons. With all of these it is fully established that spraying is profitable in average seasons, and it only remains to adequately demonstrate to the growers the methods and the value of the operation.

DEMONSTRATION WORK IN ANIMAL HUSBANDRY.

By Tait Butler, Veterinarian.

DAIRYING.

A uniformly high price for first-class dairy products and facilities for producing cheap forage are unquestionably two important factors in successful dairy husbandry. North Carolina has both of these, but, nevertheless, as at present conducted, dairying is not generally profitable in this State. Moreover, it is a demonstrated fact that where dairying is not now profitable it is chiefly due to a lack of personal attention to proper business management or a failure on the part of the dairyman to fully use in a practical way the large amount of dairy information available to any man who intelligently studies the business. In other words, where dairying is not now successful in this State, it is usually the fault of the dairyman rather than the existing unfavorable dairy conditions beyond his control. To be more specific, dairy failures in North Carolina are chiefly due to a failure to study, know and follow the teaching of modern dairy science, and a lack of personal attention to business management.

Recognizing the foregoing facts, the Dairy Division of the United States Department of Agriculture began dairy demonstration work in this State nearly two years ago, with the direct purpose of assisting our dairymen to obtain better results. During this time the North Carolina State Department of Agriculture has, in a limited way, co-operated with the Federal workers, and at its last meeting the State Board of Agriculture made an appropriation for the support of this work, in order that the co-operation might be more effectual and complete.

METHOD OF CONDUCTING THE WORK.

The method of conducting this work has been about as follows:

An expert dairyman of experience has been regularly employed, and during the summer, when the work was such that one man could not attend to it all, an additional man has been temporarily engaged. These men have visited the farms of dairymen in various parts of the State and endeavored to assist them in obtaining better results. At the first visit to a farm the entire plant is carefully looked over; the methods of conducting the business are inquired into; the manner of feeding is studied; the kind and quality of the products examined and the market prices learned.

After becoming familiar with the present workings of the dairy, the demonstrator is in a position to make suggestions for future improvements; but, unless the dairyman is willing to do his part and is fully interested and anxious to co-operate in the work, nothing of value will be accomplished.

If the dairyman is willing to do the extra work necessary to obtain sufficient information relative to the herd to enable the demonstrator to assist him, the work will be taken up in earnest and systematically conducted.

The work already done shows that in practically every herd there are many unprofitable cows, which largely consume the profits from the good ones. To

find out which cows are unprofitable it is necessary to weigh the milk, test it and ascertain the amount of butter fat it contains, and weigh the feeds. When this is done for a few months, the data are obtained necessary to enable the dairyman to weed out his unprofitable cows.

To help the dairyman to obtain this necessary information, scales for weighing the milk are loaned him and blank milk-record sheets furnished. The time required to weigh the milk at each milking from each cow during an entire year would not equal the loss from feeding one unprofitable cow for that length of time. The feed should be weighed three or four times a month and all changes noted and record made of the same.

At first the samples of milk for testing for butter fat are taken by the demonstrator and the test made by him. The next and subsequent months the dairyman will take the milk samples for two days immediately preceding the regular monthly visits of the demonstrator, who will make the tests for butter fat.

The dairyman must keep these necessary records and is expected to assist in calculating the results.

In the handling of the dairy products the expert will give all the assistance possible, with a view of enabling the dairyman to put upon the market a first-class product.

BUILDING OF SILOS.

In feeding, the advice and assistance of the demonstrator is frequently of great value. As a rule, our dairymen do not produce their own feed to the extent they should, nor do they give sufficient care to the character of the feeds to obtain the best results. Silos are too rare, and yet succulence is essential in dairy feeding. All dairymen are advised to use silos, and those who wish to build them are assisted to do so.

The most desirable kind of silo for the conditions existing on the farm is determined, and plans and specifications furnished free of charge. When the materials are on the ground, the demonstrator will supervise the erection of the silo, and later will direct the filling of it, in order that the dairyman may run no risk from lack of experience in such matters.

DAIRY BARN PLANS.

If a dairy barn is needed, the demonstrator will advise concerning its location and construction, even to the extent of furnishing plans, etc.

In all these and in many other ways the dairymen of the State may receive the assistance of an expert dairyman if they are sufficiently interested to do their part of the work, but no dairyman can be helped who will not help himself.

ONE DAIRYMAN'S OPINION OF THE WORK.

The work already done in this State has fully demonstrated its value. One dairyman who has been visited by the demonstrator writes:

"We have been helped, and will be glad if you will continue the visits.

"1. We have found that we only make one-half the butter from each cow that the best dairies do.

"2. We have found that we lose ten or fifteen per cent of the butter in skimming and churning.

"3. We have been induced by your agent to visit one of the best dairies in the State (about fifty miles distant), in his company, and we learned a lot of things there.

"4. I have a very high opinion of the good the dairy agents may do in this country."

FEEDING BEEF CATTLE.

The work of the State Department of Agriculture on its test farms during the past three years has demonstrated that, with our cheapest available feeds and proper facilities for handling the animals, the feeding of beef cattle may be made profitable, at least, throughout the central and western parts of the State. It is a fact, however, that the feeding of beef cattle is not generally regarded as profitable in this State.

Good feeders are too scarce, freight rates too high, and the feeds generally used too high-priced to permit of the profitable feeding of beef cattle, especially if the full value of stable manure be ignored, as is very generally done in this State.

By using a ration consisting of corn silage and corn stover, both cheap feeds and readily produced on the farm, and cotton seed and cotton-seed meal, cattle feeding may be made profitable, if proper care and intelligence be given to the purchase and care of the feeders and a fair valuation given to the stable manure.

Silage is one of the best and cheapest feeds for beef cattle, and, in cases where it is not necessary to provide extra power to drive the machinery for filling the silo, it should be used by every feeder of cattle. As is being done with the dairymen of the State, the Department of Agriculture will be pleased to furnish plans and assist in the erection of silos for any farmer in the State who contemplates erecting a silo for the feeding of beef cattle or other live stock.

The Department is anxious to encourage the feeding of more cattle for the building up of our worn and depleted soils, and would like to co-operate with every man in the State who expects to feed beef cattle in car-load or half car-load lots next winter. If desired, an expert cattle man will be sent to the farm of the feeder and advise regarding the purchase of the cattle, the feeds to be used, and the care and marketing of the animals.

Any farmer in the State wishing the assistance of the Department in animal husbandry lines should write Dr. Tait Butler, Raleigh, N. C.

ASSISTANCE IN MAINTAINING THE HEALTH OF THE HERDS.

Since it is generally conceded that tuberculosis may be communicated from cattle to man through infected milk, no dairyman can afford to maintain a herd in which tuberculosis exists. He cannot afford to maintain in his herd animals suffering from disease of any kind. He cannot afford to do these things, because they are not right, and also because they are unprofitable. If tuberculosis exists in your herd to-day, you will lose animals from the disease regularly during the coming years, unless you eradicate it.

There is only one way to clear a herd of tuberculosis and keep it clear. That is, to tuberculin test every animal in the herd once a year, and test all animals brought into the herd before their introduction, and exclude all diseased animals.

The State Department of Agriculture will assist dairymen and cattle breeders to eradicate tuberculosis from their herds, and maintain them healthy, free of charge, on the following terms:

1. The owners must furnish the help and all other facilities necessary to enable one veterinarian to do the work.

2. All diseased animals must be disposed of according to the direction of the State Veterinarian.

3. The owner of the herd must agree to and afford the proper facilities for retesting the herd once a year.

4. All new animals brought into the herd must be tested before their introduction, or isolated until the regular yearly test.

Any person complying with the conditions above stated, and maintaining a herd free of disease, may receive from the State Veterinarian a certificate stating these facts.

Any cattle breeder or owner of a herd of five or more animals may avail himself of this privilege by communicating with the State Veterinarian.

REPORT OF FARMERS' INSTITUTE WORK, 1908.

By Tait Butler, Director.

During the last year—December 1, 1907, to December 1, 1908—there have been held 234 institutes under the direction of the State Department of Agriculture. Of these, 151 have been regular Farmers' Institutes for men, 14 Orchard Demonstration Institutes, 68 Institutes for Women, and 1 five-day Short-course Dairy School. In addition, a round-up institute, or, as it is generally known, State Farmers' Convention, was held, embracing separate meetings for both men and women.

Institutes have been held in 95 of the 98 counties of the State—all except Dare, Carteret and New Hanover. The number of institutes held this year has been greater than ever before, as the following will show:

1898— 28 institutes in 27 counties.
1903— 17 institutes in 16 counties.
1904— 58 institutes in 58 counties.
1905— 79 institutes in 76 counties.
1906—136 institutes in 91 counties.
1907—169 institutes in 93 counties.
1908—234 institutes in 95 counties.

Counting special institutes, there has been an increase of 66 over last year, which exceeded any previous year by 33.

The institutes for men, exclusive of round-up or dairy short course, held during this year numbered 165, exceeding those of any previous year by 46. while 68 institutes were held for women, exceeding any previous year by 19.

Even with this large increase, it was not possible to supply the demands for institutes. While a few institutes were held in new localities, where none had previously been held and from which no requests for institutes had been made, still the total number of requests considerably exceeded the total number of institutes which it was possible for us to hold.

From the experience of the last few years it is plain that in the near future not less than an average of at least three institutes to the county will supply the demand.

MEN'S INSTITUTES, 1908.

Date.	County.	Location.	Lecturers Supplied by the State.
Aug. 1	Alamance	Graham	Massey, Cates, Butler.
Aug. 17	Alexander	Taylorsville	Stevens, Browne.
Aug. 12	Alleghany	Sparta	Hutt, Michels, Finley.
Aug. 13	Alleghany	Laurel Springs	Hutt, Michels, Finley.
July 24	Anson	Bethel	Stevens, Hutt, French.
July 25	Anson	Polkton	Stevens, Hutt, French.
Aug. 14	Ashe	Jefferson	Hutt, Michels, Finley.
Aug. 15	Beaufort	Washington	Butler, Parker, Massey.
Jan. 30	Bertie	Aulander	Browne.
Jan. 31	Bertie	Windsor	Browne.
July 23	Bladen	Clarkton	Stevens, Hutt, French.
July 27	Bladen	White Oak	French.
July 23	Brunswick	Supply	Butler, Layton.
Aug. 13	Buncombe	Sand Hill	Sherman, Shaw.
Aug. 17	Buncombe	Farm School	French, Williams, Reimer.
Aug. 8	Burke	Morganton	French, Williams, Shaw.
Aug. 20	Burke	Connelly Springs	Stevens, Browne, Meacham.
Aug. 7	Cabarrus	St. John's Church	Jeffrey, Hudson.
Aug. 12	Cabarrus	Concord	Stevens, Browne, Meacham.
Aug. 19	Caldwell	Collettsville	Hutt, Michels.
Aug. 20	Caldwell	Granite Falls	Hutt, French.
Jan. 28	Camden	Shiloh	Butler, Parker.
July 24	Caswell	Leasburg	Sherman, Newman, Wilder.
July 25	Caswell	Yanceyville	Sherman, Newman, Wilder.
July 28	Caswell	Pelham	Butler, Massey, Cates.
Aug. 18	Catawba	Newton	Stevens, Browne.
Aug. 19	Catawba	Hickory	Stevens, Browne.
Aug. 21	Chatham	Pittsboro	Parker, Butler.
Aug. 21	Cherokee	Andrews	Sherman, Shaw.
Jan. 24	Chowan	Edenton	Parker, McLendon, Hutt.
Aug. 22	Clay	Hayesville	Sherman, Shaw.
July 20	Cleveland	Shelby	Butler, Massey, Conover.
July 21	Cleveland	Kings Mountain	Butler, Massey, Conover.
July 22	Columbus	Chadbourn	Stevens, Hutt, French.
July 25	Columbus	Whiteville	Butler, Layton.
Jan. 17	Craven	New Bern	Parker, McLendon.
July 28	Cumberland	Raeford	Stevens, Jeffrey, Hutt.
Aug. 7	Cumberland	East Over	Parker, Browne.
Jan. 27	Currituck	Moyock	Butler, Parker.
July 25	Davidson	Thomasville	Massey, Conover, Meacham

MEN'S INSTITUTES, 1908—Con.

Date.	County.	Location.	Lecturers Supplied by the State.
Aug. 1	Davidson	Reid's Academy	Stevens, Hutt.
Aug. 8	Davidson	Linwood	Stevens, Butler, Cates.
Aug. 5	Davie	Farmington	Sherman, Newman, Wilder.
Aug. 6	Davie	Mocksville	Sherman, Newman, Wilder.
Aug. 17	Duplin	Beulaville	Parker, Butler.
Aug. 18	Duplin	Warsaw	Parker, Butler.
Aug. 21	Durham	County Home	Williams, Reimer, Michels.
July 29	Edgecombe	State Test Farm	Parker, Browne.
July 31	Forsyth	Kernersville	Massey, Cates, Meacham.
Aug. 8	Forsyth	Winston-Salem	Massey, Jeffrey, Michels.
Aug. 10	Forsyth	Rural Hall	Massey, Hutt, Michels.
July 17	Franklin	Louisburg	Sherman, Parker, Newman.
July 22	Gaston	Lowell	Massey, Conover, Meacham.
Aug. 3	Gaston	Dallas	Jeffrey, Massey.
Aug. 10	Gates	Sunbury	Parker, Butler.
Aug. 11	Gates	Gatesville	Parker, Butler.
Aug. 20	Graham	Robbinsville	Sherman, Shaw.
July 22	Granville	Oxford	Sherman, Newman, Wilder.
July 23	Greene	Snow Hill	Parker, Shaw, Fisher.
July 27	Guilford	Jamestown	Butler, Massey, Conover.
July 30	Guilford	Brown Summit	Massey, Cates, Meacham.
Aug. 7	Guilford	McLeansburg	Stevens, French, Meacham.
July 28	Halifax	Scotland Neck	Parker, Browne, Shaw.
Jan. 10	Harnett	Dewberry	Parker, Hutt.
Aug. 4	Harnett	Dunn	Parker, Browne.
Aug. 5	Harnett	Lillington	Parker, Browne.
Aug. 15	Haywood	Waynesville	Sherman, Shaw.
Aug. 10	Henderson	Hendersonville	Sherman, Shaw, Wilder.
Aug. 12	Hertford	Winton	Parker, Massey, Butler.
Jan. 31	Hyde	Swan Quarter	Parker, Butler.
Aug. 15	Iredell	Mooresville	Stevens, Browne, Meacham.
Aug. 18	Iredell	State Test Farm	Williams, Reimer, French.
Aug. 19	Iredell	Eupeptic Springs	Williams, Reimer, French.
Aug. 11	Jackson	Sylva	Sherman, Shaw.
Aug. 1	Johnston	Smithfield	Parker, Browne, Layton.
Aug. 3	Johnston	Princeton	Stevens, French, Meacham.
Aug. 4	Johnston	Clayton	Stevens, French, Meacham.
Jan. 15	Jones	Maysville	Parker, McLendon.
Aug. 22	Lee	Jonesboro	Parker, Butler.
Aug. 13	Lenoir	La Grange	Parker, Massey.

MEN'S INSTITUTES, 1908—Con.

Date.	County.	Location.	Lecturers Supplied by the State.
Aug. 4	Lincoln	Lincolnton	Jeffrey, Massey.
Aug. 5	Lincoln	Lowesville	Jeffrey, Massey.
Aug. 17	Macon	Franklin	Sherman, Shaw.
Aug. 14	Madison	Mars Hill	French, Williams, Reimer.
Aug. 15	Madison	Marshall	French, Williams, Reimer.
Jan. 18	Martin	Williamston	Parker, McLendon.
Aug. 21	McDowell	Marion	Stevens, Browne, Meacham.
July 23	Mecklenburg	Pineville	Massey, Conover, Meacham.
July 24	Mecklenburg	Newell	Massey, Conover, Meacham.
July 31	Mecklenburg	Dixie	Stevens, Hutt.
Aug. 6	Mecklenburg	Piedmont Industrial School.	Massey, Jeffrey.
Aug. 7	Mecklenburg	Carolina Academy	Massey, Sherman, Wilder.
Aug. 13	Mecklenburg	Davidson	Stevens, Browne, Meacham.
Aug. 10	Mitchell	Spruce Pine	French, Williams, Reimer.
Aug. 11	Mitchell	Bakersville	French, Williams, Reimer.
Aug. 5	Montgomery	Star	Butler, Cates, Shaw.
Aug. 6	Montgomery	Mt. Gilead	Butler, Cates, Shaw.
July 27	Moore	Carthage	Stevens, Hutt, Jeffrey.
Aug. 4	Moore	Elise	Butler, Shaw, Cates.
July 25	Nash	Nashville	Parker, Shaw, Fisher.
July 27	Northampton	Woodland	Parker, Browne, Shaw.
Jan. 14	Onslow	Richlands	Parker, McLendon, Butler.
Aug. 6	Orange	Hillsboro	Stevens, French, Meacham.
Jan. 16	Pamlico	Bayboro	Parker, McLendon.
Jan. 29	Pasquotank	Elizabeth City	Parker, Butler.
July 23	Person	Roxboro	Sherman, Wilder, Newman
Aug. 19	Pender	Burgaw	Parker, Butler.
Jan. 25	Perquimans	Hertford	Parker, McLendon, Butler
Aug. 14	Pitt	Greenville	Parker, Butler, Massey.
Aug. 12	Polk	Columbus	Sherman, Shaw.
Aug. 3	Randolph	Ashboro	Butler, Shaw, Cates.
July 29	Richmond	Ellerbe Springs	Stevens, Hutt, Jeffrey
July 30	Richmond	Rockingham	French.
July 29	Robeson	Rowland	French.
Aug. 6	Robeson	Lumber Bridge	Parker, Browne.
July 27	Rockingham	New Bethel Academy	Sherman, Wilder.
July 28	Rockingham	Stoneville	Sherman, Wilder, Newman.
July 29	Rockingham	Reidsville	Massey, Butler, Cates.
Aug. 10	Rowan	Salisbury	Stevens, Browne, Meacham.
Aug. 11	Rowan	China Grove	Stevens, Browne, Meacham.

MEN'S INSTITUTES, 1908—Con.

Date.	County.	Location.	Lecturers Supplied by the State.
Aug. 14	Rowan	Mt. Ulla	Stevens, Browne, Meacham.
Aug. 22	Rutherford	Rutherfordton	Stevens, Browne, Meacham.
Aug. 3	Sampson	Newton Grove	Parker, Layton.
Aug. 8	Sampson	Salemburg	Parker, Browne.
Aug. 1	Scotland	Gibson	Jeffrey, French.
Aug. 7	Stanly	Albemarle	Butler, Cates, Shaw.
July 29	Stokes	Sandy Ridge	Sherman, Newman, Wilder.
July 30	Stokes	Locust Hill Farm	Sherman, Newman, Wilder.
July 31	Surry	Mt. Airy	Sherman, Newman, Wilder.
Aug. 1	Surry	Dobson	Sherman, Newman, Wilder.
Aug. 19	Swain	Bryson City	Sherman, Shaw.
Aug. 11	Transylvania	Brevard	Sherman, Wilder, Shaw.
Jan. 22	Tyrrell	Columbia	Parker, McLendon, Hutt.
July 30	Union	Waxhaw	Stevens, Hutt, Jeffrey.
July 31	Union	Unionville	French, Jeffrey.
July 21	Vance	Bear Pond School	Sherman, Parker, Newman.
July 15	Wake	Green Level	Butler, Parker, Sherman.
Aug. 5	Wake	Cary	Stevens, French, Meacham.
Nov. 14	Wake	Holly Springs	Parker, Smith, Michels.
Nov. 21	Wake	Garner	Parker, Smith, Newman.
July 18	Warren	Warrenton	Sherman, Parker, Newman.
July 20	Warren	Wise	Sherman, Parker, Newman.
Jan. 20	Washington	Plymouth	Parker, McLendon.
Jan. 21	Washington	Creswell	Parker, McLendon.
Aug. 17	Watauga	Boone	Hutt, Michels, Finley.
July 30	Wayne	Pinkney	Parker, Browne, Layton.
Aug. 3	Wilkes	Wilkesboro	Sherman, Newman, Wilder.
July 24	Wilson	Wilson	Parker, Shaw, Fisher.
Aug. 4	Yadkin	Yadkinville	Sherman, Newman, Wilder.
Aug. 13	Yancey	Burnsville	French, Williams, Reimer.

INSTITUTES, LECTURERS AND SUBJECTS.

Lecturer.	Subjects.
T. E. Browne Farmer.	Peanut Culture. Corn Culture. Commercial Fertilizers.
Dr. Tait Butler Veterinarian and Director of Farmers' Institutes, State Department of Agriculture.	How to Harvest the Corn Crop. Crop Rotation. How to Eradicate the Cattle Tick. Common Diseases of Live Stock. How to Purchase Commercial Fertilizers. The Feeding of Farm Live Stock.
Miss N. W. Cobb Teacher.	Food and Cookery for the Sick. Food and Its Relation to the Body. Household and Personal Hygiene.
J. S. Cates Farm Management Division, United States Department of Agriculture.	Weeds and How to Eradicate Them. Economy in Farm Management.
J. A. Conover Dairy Expert in charge of Dairy Demonstration Work in North Carolina for the State and United States Departments of Agriculture.	Farm Dairying. How the Dairy Demonstration Work of the State and United States Departments of Agriculture May Help North Carolina Dairymen.
W. W. Finley Farmer.	Corn Culture.
Dr. Adam Fisher Veterinarian.	Diseases of Farm Live Stock.
A. L. French Farmer.	The Silo. Corn Culture. Problems in Live Stock Husbandry.
Mrs. Sue V. Hollowell	The Influence of the Woman in the Home. The Purposes and Aims of the Women's Institutes.
W. N. Hutt Horticulturist, State Department of Agriculture.	Orchard Management. The Farm Fruit Garden. Soil Improvement. Commercial Apple Growing.
Mrs. W. N. Hutt	Foods, Their Cooking and Use. The Prevention of Disease in the Home.
J. S. Jeffrey Poultryman, North Carolina Agricultural Experiment Station.	Farm Poultry. Farm Butter Making.
N. A. Layton Farmer.	The Farm Fruit Garden. Oat Culture.
W. F. Massey Horticulturist and Agricultural Writer.	Loss to Farmers and Gardeners from Poor Seed. Use and Misuse of Legumes. Planting, Pruning and Cultivating Fruit Trees. Seed Selection. The Use of Fertilizers.
Dr. W. J. McLendon Farmer.	Cotton Culture. Soil Improvement.
F. T. Meacham Superintendent Iredell Test Farm, State Department of Agriculture.	Wheat Culture. Oat Culture. Corn Culture. Terracing. The Use of Farm Machinery.
John Michels Professor of Animal Husbandry and Dairying, North Carolina College of Agriculture.	Farm Dairying. The Importance of Live Stock in North Carolina Agriculture. Feeding Farm Live Stock.
C. L. Newman Professor of Agriculture, North Carolina College of Agriculture.	Cotton Breeding. Soil Improvement. Winter Gardening. The Cowpea. Commercial Fertilizers.

INSTITUTES, LECTURERS AND SUBJECTS—Con.

Lecturer.	Subjects.
T. B. Parker, In charge of Farm Demonstration Work, State Department of Agriculture.	Commercial Fertilizers. Soil Improvement by Legumes. Alfalfa. Corn Culture.
F. C. Reimer, Horticulturist, North Carolina College of Agriculture.	Apple Growing. Soil Improvement. Fertilizers. The Farm Garden.
Dr. G. A. Roberts, Veterinarian, North Carolina College of Agriculture.	Diseases of Farm Live Stock. Care and Feeding of Farm Work Stock. Lameness.
R. W. Scott, Farmer.	Corn Culture. How a Farmer May Succeed in North Carolina without Growing Cotton or Tobacco. The Advantages of a Diversified Agriculture.
S. B. Shaw, Assistant Horticulturist, State Department of Agriculture.	The Farm Vegetable Garden. Fruit Growing. Seed Selection.
Franklin Sherman, Jr., Entomologist, State Department of Agriculture.	Insect Pests and How to Combat Them. Suggestions for the Improvement of Farm Homes.
Dr. F. L. Stevens, Professor of Botany and Plant Diseases, North Carolina College of Agriculture.	Plant Diseases and Spraying. The Value of an Agricultural Education (Illustrated).
Mrs. F. L. Stevens	Home Nursing. Saving Steps in the Home. The Improvement of the Farm Home (Illustrated).
C. B. Williams, Director Agricultural Experiment Station, North Carolina Agricultural and Mechanical College.	Commercial Fertilizers and Their Use. The Improvement of Corn and Cotton by Seed Selection.
T. B. Wilder	How to Build Wire Fences. The Care and Use of Farm Machinery. Sheep Raising.

COUNTY AND LOCAL MEN'S ORGANIZATIONS.

There now exists a Farmers' Institute organization, or committee, in each of 96 counties of the State—in all except the counties of Carteret and Dare—and in several counties, such as Catawba, Forsyth, Iredell, Mecklenburg and Rowan, where more than one institute has been held annually for several years, there have also been organized local institute committees.

Up to this time no effort has been made to extend the scope and duties of the county organization beyond the selecting of a committee, consisting of one active farmer from each township, and requiring of it the advertising and arranging for the annual institute.

That each township and, eventually, each neighborhood, should maintain a Farmers' Institute organization for the purpose of creating interest in and disseminating agricultural information is beyond question, but in many sections there has not yet been developed sufficient interest in this work to actuate the existing simple county organizations to properly arrange for and advertise one county institute each year. In such cases it would be useless to attempt a more complex organization for the extension of the work, but in several counties or sections there now appears to be sufficient interest to justify an attempt

to extend the organization to the formation of township or neighborhood clubs, or institutes, with more frequent meetings of both the local and county organizations. In several counties of the State local clubs or institutes, holding meetings monthly, bi-monthly or quarterly, and the county organizations, holding institutes quarterly or semiannually, seem not too much to expect in the near future, and during the coming year an attempt will be made to effect such an extension of the work in several of the more progressive counties.

CHAIRMEN OF COUNTY AND LOCAL FARMERS' INSTITUTE COMMITTEES.

County.	Chairman of Committee.	Post Office.
Alamance	Charles F. Cates	Mebane.
Alexander	J. N. Smith	Taylorsville.
Alleghany	S. F. Thompson	Walls.
Anson	Dr. W. J. McLendon	Wadesboro.
Ashe	John Dent	Jefferson.
Beaufort	W. D. Grimes	Washington.
Bertie	C. W. Spruill	Quitsna.
Bladen	R. B. Cromartie	Elizabethtown.
Brunswick	Jack Johnson	Winnabow.
Buncombe	C. P. Weaver	Alexander.
Burke	J. E. Coulter	Connelly Springs.
Cabarrus	J. P. Allison	Concord.
Cabarrus	Wm. Fisher (Local, St. John's Church)	Mt. Pleasant.
Caldwell	George Goforth	Lenoir.
Camden	W. G. Ferebee	Gregory.
Caswell	T. P. Womack	Yanceyville.
Caswell	E. W. Lee (Local, Leasburg)	Leasburg.
Catawba	C. E. Smyre	Newton.
Catawba	John Robinson (Local, Hickory)	Hickory.
Chatham	W. B. Wilson	Patmos.
Cherokee	W. P. Walker	Andrews.
Chowan	M. Makeley	Edenton.
Clay	W. T. Bumgarner	Hayesville.
Cleveland	J. T. Gardner	Shelby.
Cleveland	Samuel Farris (Local, Kings Mountain)	Kings Mountain.
Columbus	M. Meares	Tabor.
Columbus	D. Boughner (Local, Chadbourn)	Chadbourn.
Craven	J. M. Spencer	New Bern.
Cumberland	W. H. Downing	Fayetteville.
Cumberland	T. B. Upchurch (Local, Raeford)	Raeford.
Currituck	J. J. Morse	Moyock.
Davidson	P. J. Leonard	Lexington.
Davie	S. A. Woodruff	Mocksville.

CHAIRMEN OF COUNTY AND LOCAL FARMERS' INSTITUTE COMMITTEES—Con.

County.	Chairman of Committee.	Post Office.
Duplin	J. A. Shine	Faison.
Durham	P. H. Massey	Durham.
Edgecombe	G. T. Deberry	Tarboro.
Forsyth	A. B. Atwood	Winston-Salem.
Forsyth	L. A. Strupe (Local, Rural Hall)	Tobaccoville.
Franklin	T. B. Wilder	Louisburg.
Gaston	C. F. Smith	Stanley.
Gates	Lycurgus Hofler	Gatesville.
Graham	G. B. Walker	Robbinsville.
Granville	Dr. J. A. Morris	Oxford.
Greene	J. T. Frizzell	Snow Hill.
Guilford	J. Franklin Davis	Guilford College.
Guilford	George W. Darson (Local, Brown Summit)	Brown Summit, R.F.D. 2.
Halifax	J. R. Sherron	Enfield.
Harnett	C. McArtan	Lillington.
Haywood	Dr. G. D. Green	Waynesville.
Henderson	J. P. Fletcher	Fletcher.
Hertford	W. P. Shaw	Winton.
Hyde	Charles Brin	Swan Quarter.
Iredell	W. L. Matheson (Local, Mooresville)	Mooresville.
Jackson	G. P. Miller	Sylva.
Johnston	W. M. Sanders	Smithfield.
Jones	K. R. Hay (Local, Mayesville)	Mayesville.
Lee	W. I. Brooks	Jonesboro.
Lenoir	G. F. Loftin	Kinston.
Lincoln	H. S. Robinson	Lincolnton.
Macon	Arthur Siler	Franklin.
Madison	J. F. Bryan	Marshall.
Madison	J. R. Sams (Local, Mars Hill)	Mars Hill.
Martin	W. A. Everett	Robersonville.
McDowell	Dr. R. J. Burgin	Marion.
Mecklenburg	C. C. Moore	Charlotte.
Mecklenburg	W. C. Barnett (Local, Pineville)	Pineville.
Mecklenburg	N. S. Alexander (Local, Hickory Grove)	Charlotte.
Mecklenburg	William Caldwell (Local, Huntersville)	Huntersville.
Mecklenburg	James Kirk (Local, Newell)	Newell.
Mitchell	S. M. C. Green	Toecane.
Montgomery	C. C. Wade	Troy.
Montgomery	J. L. Stuart (Local, Star)	Star.
Moore	William J. Harrington	Glendon.

CHAIRMEN OF COUNTY AND LOCAL FARMERS' INSTITUTE COMMITTEES—Con.

County.	Chairman of Committee.	Post Office.
Nash	S. F. Austin	Nashville.
New Hanover	George Trask	Wilmington.
Northampton	T. C. Peele	Rich Square.
Onslow	Dr. J. L. Nicholson (Local, Richlands)	Richlands.
Orange	S. W. Andrews	Hillsboro.
Pamlico	W. H. Sawyer	Bayboro.
Pasquotank	R. N. Morgan	Elizabeth City.
Pender	W. M. Hand	Burgaw.
Perquimans	David Cox	Hertford.
Person	J. A. Long	Roxboro.
Pitt	O. L. Joyner	Greenville.
Polk	T. T. Ballinger	Tryon.
Randolph	John F. Beeson	Randleman.
Richmond	W. I. Everett	Rockingham.
Robeson	E. F. McRae	Maxton.
Rockingham	J. V. Price	Madison.
Rowan	R. L. Thomason	Salisbury.
Rowan	J. K. Goodwin (Local, Mt. Ulla)	Mt. Ulla.
Rowan	B. S. Brown (Local, China Grove)	China Grove.
Rutherford	W. K. McDowell	Island Ford.
Sampson	S. H. Hobbs	Clinton.
Scotland	L. D. McKinnon	Laurinburg.
Stanly	G. T. Dunlap	Norwood.
Stokes	I. G. Ross	Walnut Cove.
Surry	S. C. Franklin	Mt. Airy.
Surry	N. J. Herring (Local, Mt. Airy)	Mt. Airy.
Swain	R. L. Sandidge	Bryson City.
Transylvania	W. H. Grogan	Brevard.
Tyrrell	E. B. Hopkins	Columbia.
Union	T. J. W. Broom	Monroe.
Vance	J. B. Allen	Henderson.
Wake	W. B. Upchurch (Local, Green Level)	Apex.
Wake	H. W. Norris (Local, Holly Springs)	Holly Springs.
Wake	D. H. Buffaloe (Local, Garner)	Garner.
Warren	H. T. Macon	Warrenton.
Warren	P. R. Perkinson (Local, Wise)	Wise.
Washington	T. W. Blount	Roper.
Watauga	T. C. Baird	Valle Cruces.
Wayne	H. D. Ham	Goldsboro.
Wilkes	J. G. Hackett	North Wilkesboro.

CHAIRMEN OF COUNTY AND LOCAL FARMERS' INSTITUTE COMMITTEES—Con.

County.	Chairman of Committee.	Post Office.
Wilson	Walter F. Woodard	Wilson.
Yadkin	John F. Long	Chestnut Ridge.
Yancey	W. B. Wray	Cane River.

STATE FARMERS' CONVENTION.

State at Large	A. L. French, President, Rockingham County	R. F. D., Byrdville, Va.
State at Large	Tait Butler, Secretary, Wake County	Raleigh, N. C.

WOMEN'S INSTITUTES, 1908.

The holding of institutes for the women in the farm homes was inaugurated in 1906, and 21 institutes were held in 19 counties. During 1907 this work was greatly extended, there being held 50 institutes in 38 counties. During 1908 the number was also largely increased, 68 institutes being held in 46 counties.

The success of these Women's Institutes has more than justified our assumption that an effort to improve rural conditions through the co-operation of the women on the farms would be as effective as the institutes for men had been. Allowing for the general lack of knowledge regarding the purposes or objects of these institutes, the interest in them and the appreciation shown for the information sought to be imparted have been very gratifying, and indicate very plainly that the women on the farms of the State are ready to take hold of the work and make it a tremendous power for the upbuilding of farm conditions and farm life. The best farms are impossible without the best farm homes, and a knowledge of modern domestic science is as important and useful to the woman who is to develop and maintain the ideal farm home of the future as is a knowledge of modern agricultural science to the man who is to build up a model farm.

For the benefit of those not entirely familiar with the scope and nature of the work contemplated by these Women's Institutes, the following list of subjects is given as a sample of the topics discussed:

The Farm Fruit Garden.
The Farm Vegetable Garden.
Farm Poultry.
Farm Butter Making.
Beautifying the Home Surroundings.
Home Conveniences.
Literature for the Farm Home.
Home-making.
Home Nursing.
The Nutritive Value of Foods.
Cooking Meats, Vegetables, etc.
Bread Making.
Educating the Girls on the Farm.
Home Sanitation.

The usual practice has been to hold the Women's Institute on the same day and at the same place as the institute for men, but in a separate hall. At least one, and usually two, separate sessions are held, which enable the women to form an organization of their own and permit of greater freedom in the discussion of special household topics, many of which would neither be instructive nor interesting to a mixed or general audience.

Two women lecturers are usually sent out by the State to each meeting, and when a joint afternoon session is not held with the men, some of the lecturers from the men's institute usually assist at the women's meeting in the discussion of such subjects as dairying, poultry raising and gardening.

The objects of these women's meetings, as with those for men, has been one of instruction rather than entertainment.

WOMEN'S INSTITUTES, 1903.

Date.	County.	Location.	Lecturers Supplied by the State.
Aug. 1	Alamance	Graham	Mrs. Hutt, Mrs. Hollowell.
Aug. 17	Alexander	Taylorsville	Mrs. Stevens, Miss Cobb.
July 24	Anson	Bethel	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
July 25	Anson	Polkton	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
Oct. 30	Anson	Wadesboro	Mrs. Stevens.
Jan. 30	Bertie	Aulander	Mrs. Stevens, Mrs. Hutt.
Jan. 31	Bertie	Windsor	Mrs. Stevens, Mrs. Hutt.
July 23	Bladen	Clarkton	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
Aug. 20	Burke	Connelly Springs	Mrs. Stevens, Miss Cobb.
Aug. 7	Cabarrus	St. John's Church	Mrs. Hutt, Mrs. Hollowell.
Aug. 12	Cabarrus	Concord	Mrs. Stevens, Miss Cobb.
Jan. 28	Camden	Shiloh	Mrs. Stevens, Mrs. Hutt.
July 28	Caswell	Pelham	Mrs. Hutt, Mrs. Hollowell.
Aug. 18	Catawba	Newton	Mrs. Stevens, Miss Cobb.
Aug. 19	Catawba	Hickory	Mrs. Stevens, Miss Cobb.
Aug. 21	Chatham	Pittsboro	Mrs. Hutt, Mrs. Hollowell.
July 20	Cleveland	Shelby	Mrs. Hutt, Mrs. Hollowell.
July 21	Cleveland	Kings Mountain	Mrs. Hutt, Mrs. Hollowell.
Jan. 17	Craven	New Bern	Mrs. Stevens, Mrs. Hollowell.
July 28	Cumberland	Raeford	Mrs. Stevens, Miss Cobb.
Jan. 27	Currituck	Moyock	Mrs. Stevens, Mrs. Hutt.
July 25	Davidson	Thomasville	Mrs. Hutt, Mrs. Hollowell.
Aug. 8	Davidson	Linwood	Mrs. Stevens, Miss Cobb.
Aug. 18	Duplin	Warsaw	Mrs. Hutt, Mrs. Hollowell.
July 31	Forsyth	Kernersville	Mrs. Hutt, Mrs. Hollowell.
July 17	Franklin	Louisburg	Mrs. Hutt, Mrs. Hollowell.
July 22	Gaston	Lowell	Mrs. Hutt, Mrs. Hollowell.
Aug. 3	Gaston	Dallas	Mrs. Hutt, Mrs. Hollowell.
July 27	Guilford	Jamestown	Mrs. Hutt, Mrs. Hollowell.

WOMEN'S INSTITUTES, 1908—Con.

Date.	County.	Location.	Lecturers Supplied by the State.
July 30	Guilford	Brown Summit	Mrs. Hutt, Mrs. Hollowell.
Aug. 7	Guilford	McLeansburg	Mrs. Stevens, Miss Cobb.
Aug. 15	Iredell	Mooresville	Mrs. Stevens, Miss Cobb.
Aug. 3	Johnston	Princeton	Mrs. Stevens, Miss Cobb.
Aug. 4	Johnston	Clayton	Mrs. Stevens, Miss Cobb.
Jan. 15	Jones	Maysville	Mrs. Stevens, Mrs. Hollowell.
Aug. 22	Lee	Jonesboro	Mrs. Hutt, Mrs. Hollowell.
Aug. 13	Lenoir	La Grange	Mrs. Hutt, Mrs. Hollowell.
Aug. 4	Lincoln	Lincolnton	Mrs. Hutt, Mrs. Hollowell.
Aug. 5	Lincoln	Lowesville	Mrs. Hutt, Mrs. Hollowell.
Jan. 18	Martin	Williamston	Mrs. Stevens, Mrs. Hollowell.
July 23	Mecklenburg	Pineville	Mrs. Hutt, Mrs. Hollowell.
July 24	Mecklenburg	Newell	Mrs. Hutt, Mrs. Hollowell.
Aug. 6	Mecklenburg	Piedmont Industrial School.	Mrs. Hutt, Mrs. Hollowell.
Aug. 13	Mecklenburg	Davidson	Mrs. Stevens, Miss Cobb.
July 27	Moore	Carthage	Mrs. Stevens, Miss Cobb.
Jan. 14	Onslow	Richlands	Mrs. Stevens, Mrs. Hollowell.
Jan. 16	Pamlico	Bayboro	Mrs. Stevens, Mrs. Hollowell.
Jan. 29	Pasquotank	Elizabeth City	Mrs. Stevens, Mrs. Hutt.
Aug. 19	Pender	Burgaw	Mrs. Hutt, Mrs. Hollowell.
Jan. 25	Perquimans	Hertford	Mrs. Stevens, Mrs. Hutt.
Aug. 14	Pitt	Greenville	Mrs. Hutt, Mrs. Hollowell.
July 29	Richmond	Ellerbe Springs	Mrs. Stevens, Miss Cobb.
July 29	Rockingham	Reidsville	Mrs. Hutt, Mrs. Hollowell.
Aug. 10	Rowan	Salisbury	Mrs. Stevens, Miss Cobb.
Aug. 11	Rowan	China Grove	Mrs. Stevens, Miss Cobb.
Aug. 14	Rowan	Mt. Ulla	Mrs. Stevens, Miss Cobb.
Aug. 1	Scotland	Gibson	Mrs. Stevens, Miss Cobb.
Jan. 22	Tyrrell	Columbia	Mrs. Stevens, Mrs. Hollowell, Mrs. Hutt.
July 30	Union	Waxhaw	Mrs. Stevens, Miss Cobb.
July 31	Union	Unionville	Mrs. Stevens, Miss Cobb.
July 21	Vance	Bear Pond School	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
July 31	Wake	Green Level	Mrs. Hutt, Mrs. Hollowell.
Aug. 5	Wake	Cary	Mrs. Stevens, Miss Cobb.
July 18	Warren	Warrenton	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
July 20	Warren	Wise	Mrs. Stevens, Miss Cobb, Mr. Jeffrey.
Jan. 20	Washington	Plymouth	Mrs. Stevens, Mrs. Hollowell.
Jan. 21	Washington	Creswell	Mrs. Stevens, Mrs. Hollowell, Mrs. Hutt.

COUNTY AND LOCAL WOMEN'S ORGANIZATIONS.

The same general plan of organization has been followed with the Women's Institutes as with those for men. A county institute committee was selected in each county where an institute was held, and where there was more than one institute in a county a local committee was also organized. When these county committees become sufficiently interested and active, then township or neighborhood clubs or institutes, with more frequent meetings, are organized.

In many places in the State the women are organizing local branches of the Woman's Branch of the Farmers' Institute. Some have become firm organizations, strong and self-supporting, and others are struggling still for even an existence. Extracts from two reports of the work will show best the trials and the triumphs of the women. The first is from a brave, busy little woman, who will have a cheerful report yet to give, and the other speaks for itself:

"I can hardly tell you how we are getting on with our work. Our ladies do not seem to be interested in the work. I can't get them to come to the meetings; I have been to one or two and nobody else would go, so you see it is hard to ever do anything when you can't get them together—though I have not given up yet. I am still trying to awaken interest. I hope and pray for a better progress in the future. You could not but help seeing from the appearance of some of the ladies that it is education that is needed to make them more interested in this great work. They say, 'We can't leave home one afternoon in a month; our chickens and various poultry keep us at home.' I try to explain to them how much good it would do them, both carnally and spiritually as well as socially. I tell them a nice social evening or afternoon would help them wonderfully, but some of them do not think so. So you see what obstacles have been in my path."

A SUCCESSFUL ORGANIZATION.

"We had an institute meeting in January which was a success, I think. We served a luncheon of sandwiches and coffee with fruit, given by the grocers. The plates this luncheon was served on were given by the merchants. Each person took home a plate, cup, saucer, spoon, bottle of Wells & Richardson's butter color, a tablet and pencil, woolen scraps from Hargrave & Leak skirt factory, and several other little articles. The name of the merchant who contributed was on the article which each gave. We had a poultry show in connection with this.

"Our hardware men loaned us churns, stoves and the conveniences used in housekeeping, a system of hot and cold water was shown and explained. Pretty prints of 'Gilt Edge' butter, made by the ladies, were sold. Different articles were sold or exchanged. Poultry was exhibited and quite a number sold. We had a good meeting."

Thus, you see, ladies, you can do nothing better than to organize one in your home county or neighborhood.

CHAIRMEN OF COUNTY AND LOCAL WOMEN'S INSTITUTE COMMITTEES.

County.	Chairman of Committee.	Post Office.
Alamance	Miss Eula Dixon	Snow Camp.
Alexander	Mrs. J. T. Rowland	Taylorsville.
Anson	Mrs. J. G. Boylin	Wadesboro.
Anson	Mrs. C. Redfearn, Secretary	Wadesboro.
Anson	Mrs. S. K. Harris (Local, Polkton)	Polkton.
Bertie	Mrs. H. M. Dunston	Windsor.
Bertie	Mrs. Judd Dunning	Aulander.
Bladen	Mrs. G. L. Clark	Clarkton.
Burke	Mrs. F. S. Asbury	Morganton, R. 2.
Cabarrus	Mrs. R. A. Brown	Concord.
Cabarrus	Mrs. Paul Means (Local, Concord)	Concord.
Cabarrus	Mrs. R. A. Brown (Local, St. John's Church)	Concord.
Camden	Mrs. Willis G. Ferebee	Gregory.
Caswell		Pelham.
Catawba	Mrs. Noah Huit	Conover, R. 2.
Catawba	Mrs. J. W. Robinson (Local, Hickory)	Newton, R. 4.
Chatham	Mrs. J. A. Pearley	Pittsboro.
Chowan	Mrs. D. G. Bond	Edenton.
Cleveland	Mrs. Frank Elams	Cleveland Mills.
Cleveland	Miss Sallie Ware (Local, Kings Mountain)	Kings Mountain.
Columbus	Mrs. E. H. Miller	Chadbourn.
Cumberland	Mrs. J. H. Currie	Fayetteville.
Cumberland	Mrs. John Moore (Local, Raeford)	Raeford.
Currituck	Mrs. M. C. Poyner	Moyock.
Davie	Mrs. Sarah Hanes	Mocksville.
Davidson	Mrs. W. L. Kivett (Local, Thomasville)	High Point.
Davidson	Mrs. B. E. Meacham (Local, Linwood)	Linwood, R. 1.
Duplin	Mrs. Don Moore	Warsaw, R. 1.
Durham	Mrs. P. H. Massey	Durham, R. 3.
Forsyth	Mrs. J. Gilmer Koerner (Local, Kernersville)	Kernersville.
Franklin	Mrs. J. R. Jones	Katesville.
Gaston	Miss Mabel Bulwinkle	Dallas.
Gaston	Mrs. S. M. Robinson (Local, Lowell)	Lowell.
Granville	Mrs. B. F. Hester	Oxford, R. 1.
Guilford	Mrs. T. N. Sellers (Local, Brown Summit)	Brown Summit.
Guilford	Miss Elva Blair	High Point, R. 3.
Guilford	Mrs. A. C. Rankin (Local, McLeansburg)	Greensboro, R. 4.
Harnett	Mrs. S. H. Washburn	Lillington.
Iredell		

CHAIRMEN OF COUNTY AND LOCAL WOMEN'S INSTITUTE COMMITTEES—Con.

County.	Chairman of Committee.	Post Office.
Iredell	Mrs. T. J. Williams (Local, Mooresville)	Mooresville.
Johnston	Mrs. D. G. Wellons	Smithfield.
Johnston	Mrs. D. E. McKinney (Local, Princeton)	Princeton.
Johnston	Mrs. R. H. Gower (Local, Clayton)	Clayton.
Jones	Miss Florence Wooten	Maysville.
Lee	Mrs. J. H. Henley	Sanford, R. 1.
Lenoir	Miss B. L. Elmore	Kinston, R. 4.
Lenoir	Mrs. W. J. Dawson (Local, La Grange)	La Grange.
Lincoln	Mrs. T. H. Cansler	Lincolnton.
Lincoln	Mrs. W. N. Connell (Local, Lowesville)	Stanley, R. 2.
Martin	Mrs. A. G. Griffin	Williamston, R. 1.
Mecklenburg	Mrs. B. T. Price	Charlotte, R. F. D.
Mecklenburg	Mrs. Perry Pegram (Local, Shopton)	Charlotte, R. 12.
Mecklenburg	Mrs. John F. Caldwell (Local, Davidson)	Davidson.
Mecklenburg	Mrs. G. B. Bryant (Local, Pineville)	Matthews.
Mecklenburg	Mrs. S. S. Caldwell (Local, Newell)	Newell.
Mecklenburg	Miss M. C. Squires, Secretary (Local, Newell),	Charlotte, R. 8.
Mecklenburg	Miss Ida Clark (Local, P. Ind. School)	Charlotte, R. 9.
Mecklenburg	Mrs. Z. W. S. Tayloe (Local, Hickory Grove)	Charlotte, R. 9.
Mecklenburg	Mrs. G. F. Overcash (Local, Huntersville)	Huntersville.
Mecklenburg	Mrs. Dr. Abernethy (Local, Alexander Academy.)	Charlotte, R. 2.
Moore	Mrs. H. F. Sewell	Carthage.
Onslow	Mrs. J. E. Rhodes	Richlands.
Orange	Mrs. H. D. Woods	Cedar Grove.
Pamlico	Mrs. G. T. Farnell	Bayboro.
Pasquotank	Mrs. J. N. Winslow	Elizabeth City.
Pender	Mrs. E. McN. Moore	Burgaw.
Perquimans	Mrs. B. Perry	Belvidere.
Pitt	Mrs. R. R. Cotten	Bruce.
Richmond	Mrs. E. D. Whitlock	Rockingham.
Richmond	Mrs. W. R. Coppedge, Secretary	Rockingham.
Richmond	Miss Lillie Baldwin (Local, Ellerbe Springs)	Ellerbe Springs.
Robeson	Mrs. W. K. Culbreth	Lumberton, R. 6.
Robeson	Mrs. R. N. Williams	Maxton.
Robeson	Mrs. K. M. Barnes (Local, Barnesville)	Barnesville.
Rockingham	Mrs. T. F. Humphreys (Local, Reidsville)	Wentworth, R. 1.
Rockingham	Mrs. J. D. Meador	Stoneville, R. 1.
Rowan	Miss Ellen Barringer	Salisbury, R. 4.

CHAIRMEN OF COUNTY AND LOCAL WOMEN'S INSTITUTE COMMITTEES—Con.

County.	Chairman of Committee.	Post Office.
Rowan	Mrs. E. L. Fisher (Local, China Grove)	China Grove.
Rowan	Miss Mattie Miller (Local, Mt. Ulla)	Mt. Ulla, R. 2.
Rutherford	Mrs. J. W. Griffin	Rutherfordton.
Scotland	Mrs. J. M. Wright	Laurinburg.
Scotland	Mrs. John McGregor (Local, Gibson)	Gibson.
Stokes	Miss D. B. Petree	King, R. 1.
Tyrrell	Mrs. C. W. Swain	Jerry.
Union	Miss Jessie Edwards (Local, Carmel)	Monroe, R. 4.
Union	Mrs. L. L. Green (Local, Marshville)	Marshville, R. 3.
Union	Mrs. H. M. McCain (Local, Waxhaw)	Waxhaw, R. 2.
Union	Mrs. W. B. Presson (Local, Unionville)	Unionville.
Vance	Mrs. J. A. Gill	Henderson, R. 4.
Wake	Mrs. A. S. Sears (Green Level)	Morrisville, R.
Wake	Mrs. W. G. Clements (Local, Cary)	Morrisville.
Warren	Mrs. J. F. Hunter	Arcola.
Warren	Miss Rosa Cole (Local, Wise)	Wise.
Washington	Mrs. T. L. Satterthwaite	Plymouth.
Washington	Miss Sadie Eberon	Creswell.
Wayne	Mrs. M. T. Johnson	Fremont.
Wayne	Miss Lillie Cox	Dudley, R. 2.

WOMEN'S BRANCH OF FARMERS' CONVENTION.

State at Large	Mrs. W. N. Hutt	Raleigh.

DEMONSTRATION RAILWAY CARS.

For many years special trains or cars have been run in a large number of States for the purpose of carrying institute workers and materials for illustrating their work. But, with the exception of the Corn Growers' Special, run by the Norfolk and Southern Railway and the Experiment Station of the A. and M. College, C. B. Williams, Director, during March, 1908, no use of this means of conducting institutes had been made in the work in this State prior to this season.

The special trains are usually run so as to devote at most a few hours at a place, from three to ten stops being made each day. In this way much spectacular effect is obtained, but facilities and opportunities for teaching are sacrificed. While one whole day is all too little if much real instruction is to be given, there is, unquestionably, much to be gained in effective work by the facilities which one or two cars offer for carrying materials, apparatus and implements for demonstrations.

During the past institute season it was determined to use two cars—one for domestic-science demonstrations and the other for agricultural implements, seeds, spraying and dairy apparatus, etc., for demonstrations at the men's meetings.

The institutes were held as usual, three sessions being held, forenoon, afternoon and night, in order that nothing might be lost in facilities for instructional work, but that materials might be present for demonstrations.

A passenger coach, from one end of which two seats were removed, was fitted up as a modern kitchen, with labor-saving utensils and devices. In this kitchen was an oil stove, oven, ice box, kitchen cabinet, fireless cooker, sink and necessary utensils. The remaining seats of the car were utilized for seating those attending the demonstrations, and when the attendance was not too large, the Women's Institute was held in this car.

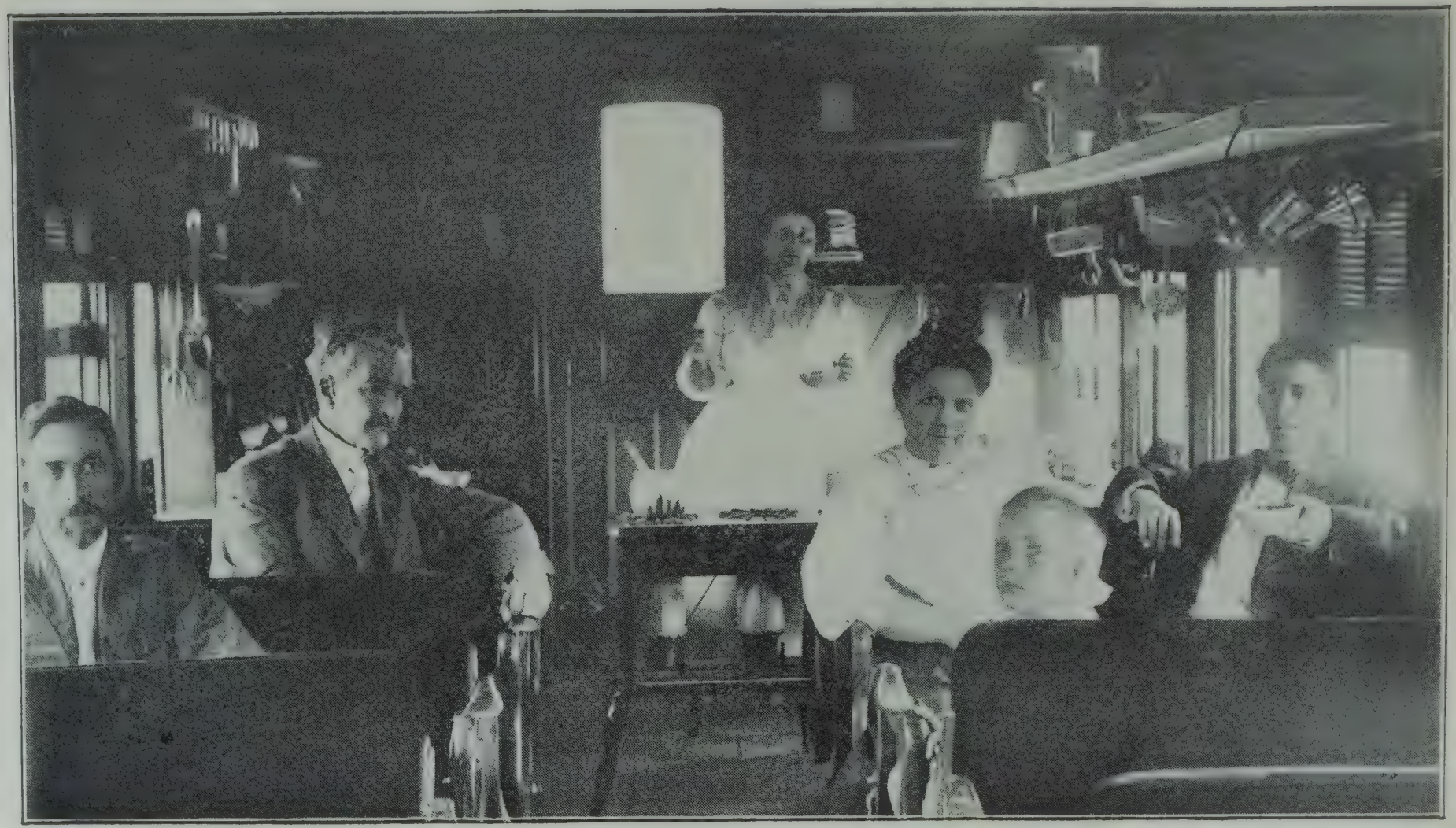
It is believed that this is probably the first domestic-science car ever run, but it clearly demonstrated its utility in rendering more effective the work of the women's institutes by offering facilities for actual demonstrations of many of the things taught.

Another car was filled with modern improved agricultural implements, etc., and whenever practicable the farmers furnished teams and these implements were taken to the fields and their working demonstrated.

These cars were furnished and hauled free of charge by the Southern Railway Company, through the courtesy and co-operative assistance of Mr. M. V. Richards, of the Land and Industrial Department of the company.

These cars were used at thirty institutes, separate meetings for the men and women being held in the forenoon and for a part of the afternoon and joint meetings for the remainder of the afternoon and at night.

The results obtained were more than satisfactory, especially with the domestic-science car, and it is felt that this use of the car for the purpose of adding better facilities for teaching is the proper use of the special institute car or train rather than the spectacular effect, which has apparently been the chief aim and must result from the short time usually spent at each stopping place with the special institute train.



Interior Domestic Science Car.

The farm-machinery car was in charge of Mr. F. T. Meacham, Superintendent of the Iredell Test Farm of the State Department of Agriculture, who conducted the field demonstrations.

The following kindly loaned implements and other apparatus and materials for the Institute cars, for which the grateful appreciation of the Institute Director and workers is hereby acknowledged:

Bateman Mfg. Co. (agricultural implements), Greenloch, N. J.
Cole Mfg. Co. (agricultural implements), Charlotte, N. C.
N. C. College of Agriculture and Mechanic Arts.
Duane H. Nash, Inc. (agricultural implements), Millington, N. J.
The Blanton Hardware Co. (agricultural implements), Shelby, N. C.
S. L. Allen & Co. (agricultural implements), Philadelphia, Pa.
Standard Oil Co.
De Laval Separator Co., New York, N. Y.
Creamery Package Mfg. Co., Chicago, Ill.
Hart-Ward Hardware Co., Raleigh, N. C.
Boylan-Pearce Co., Raleigh, N. C.
Royall & Borden Furniture Co., Raleigh, N. C.
G. L. Vinson, Plumber, Raleigh, N. C.
J. P. Wyatt & Son (agricultural implements), Raleigh, N. C.

ORCHARD DEMONSTRATION INSTITUTES.

During the past year 14 Orchard Demonstration Institutes were held in the counties of Alexander, Caldwell, Haywood, Henderson, Jackson, Stokes, Surry, Swain and Watauga, as follows:

ORCHARD DEMONSTRATION INSTITUTES.

Date.	County.	Location.	Lecturers Supplied by the State.
Feb. 3	Alexander-Wilkes.	Brushy Mountains	Sherman, Shaw.
Sept. 18	Alexander-Wilkes.	Brushy Mountains	W. N. Hutt.
Feb. 5	Caldwell	Lenoir	Sherman, Hutt.
Sept. 21	Caldwell	Lenoir	W. N. Hutt.
Feb. 17	Haywood	Waynesville	Shaw, Clapp.
Sept. 29	Haywood	Waynesville	W. N. Hutt.
Feb. 15	Henderson	Dana	Shaw, Clapp.
Sept. 26	Henderson	Dana	W. N. Hutt.
Feb. 18	Jackson	Sylva	Shaw, Clapp.
Jan. 31	Stokes	King	Sherman, Shaw.
Feb. 1	Surry	Mt. Airy	Sherman, Shaw.
Sept. 15	Surry	Mt. Airy	W. N. Hutt.
Feb. 19	Swain	Bryson City	Shaw, Clapp.
Sept. 23	Watauga	Blowing Rock	W. N. Hutt.

These institutes were held to show the best methods of pruning and spraying fruit trees. The meetings were held right out in the orchards, where the demonstrators could actually do the work and have the trees to illustrate what they were talking about.

The orchards in which the demonstrations were given were selected beforehand, on account of convenient and central location. The trees used in the demonstration were generally near a road, where they could be under observation throughout the season, so that the results of the demonstration could be noted.

PRUNING, BY W. N. HUTT, HORTICULTURIST.

The demonstration of pruning proceeded about as follows:

1. The fruit growers present were taken through the orchard, and the best forms of trees for commercial orcharding were noted.

2. Those present picked out a tree which they desired to see pruned.

3. The demonstrator outlined the method of growth in trees and explained the reasons for pruning.

4. The origin of fruit buds and their development were explained.

5. Pruning tools of different kinds were shown and their uses explained by the demonstrator.

6. The tree was pruned and the principles of pruning and the why and wherefore of each step explained while the work was being done.

7. The pruned and unpruned trees were compared.

8. How to properly remove a limb and treat the resulting wound was demonstrated.

9. Different kinds of trees were pruned. For example, apple, pear, peach, plum, etc.

10. The pruning and training of a young tree were explained and demonstrated.

11. Methods of renovating old and neglected trees were shown.

12. Tools were distributed to those present and trees were pruned by them, under the direction of the demonstrator.

13. A general discussion of the subject of pruning followed these demonstrations, and questions were freely asked and answered.

SPRAYING, BY FRANKLIN SHERMAN, JR., ENTOMOLOGIST.

At the conclusion of the pruning work described above a demonstration was given of the spraying of fruit trees, to prevent damage by insects and diseases and to improve the quality of the fruit. The general method followed was similar to that of the pruning demonstration, and the trees which had already been pruned were used in the spraying demonstration.

1. A brief account was given of the most serious orchard insects which are combated by spraying, and when present these were pointed out in their actual natural location on the trees.

2. A complete barrel spraying outfit for commercial orchards and a complete bucket outfit for family orchards were exhibited, explained and put together, ready for work.

3. The manner of measuring out and dissolving the ingredients for making the *Bordeaux Mixture and Paris Green* was explained and the mixture was prepared before the audience.

4. The trees were thoroughly sprayed, the process being fully explained in every detail. Members of the audience were encouraged to take part in the work.

5. Different nozzles and extension rods were used to show their adaptability to different uses.

6. A general discussion of the subject of spraying followed, with the asking and answering of questions.

Twice during the growing season a representative of the Department went to these orchards again, each time giving another application of the same spraying mixture.

It would be very desirable to give more demonstrations of this kind in the future, not only in the western counties, but in the piedmont and eastern sections as well—particularly in counties where fruit is grown for distant shipment or to supply local markets, and where the methods of spraying are not now well understood.

Demonstrations of similar character, and using the same mixture, should be made with other crops, especially Irish potatoes, grapes and melons. With all of these it is fully established that spraying is profitable in average seasons, and it only remains to adequately demonstrate to the growers the methods and the value of the operation. It is the purpose of the Department of Agriculture to extend this work as the facilities and interest warrant.

APPLE PACKING.

When the fruit was ready to gather, the orchards where the pruning and spraying demonstrations were held were again visited and apple grading and packing demonstrations were given. By these demonstrations it is hoped to assist our fruit growers to make use of our splendid natural facilities and to encourage them in the development of a great commercial fruit industry.

RESULTS OBTAINED.

The results obtained by these Demonstration Institutes are forcibly shown by the following letters from a few of those whose trees were pruned and sprayed in the demonstrations.

Copy of letter from J. W. Spainhour, stating condition, on July 13, of the trees pruned and sprayed during the spring:

KING, N. C., July 13, 1908.

DEAR SIR:—I wish to say that the fruit on those trees sprayed is larger and more free from worms and knots. The foliage seems to be in a more vigorous condition, as I can tell a difference in the trees as far as I can see them. The apples on the trees treated seem to be perfect at this writing. The tree, half of which was treated, shows a marked difference on the half which was sprayed. Very respectfully yours,

(Signed) J. W. SPAINHOUR.

Copy of letter showing, on October 7, the results of the demonstrations:

KING, N. C., October 7, 1908.

DEAR SIR:—I wish to state that the foliage and fruit on the Winesap trees were fine: the fruit almost perfect and the foliage at this writing is fresh and green. And on the Maiden Blush tree the fruit was fine, but did not keep as well as it should have done. I sold three bushels to a cannery, and they told me these were the only apples they found with no worms in them. Foliage on this tree is now fresh and green.

Two other trees of the same variety, right near the one sprayed, foliage all off, and did not get an apple from either one fit for use. The Magnum Bonum tree, half sprayed and half not, showed a marked difference in the fruit on the sprayed side. The fruit on side that was sprayed was much larger and finer. The foliage on the side that was sprayed at this writing is fresh and green; on the side not sprayed, nearly all off.

Respectfully yours,

(Signed) J. W. SPAINHOUR.

Copy of letter from J. A. Dula, showing condition of sprayed trees July 15:

LENOIR, N. C., July 15, 1908.

DEAR SIR:—I think that the demonstration you made spraying apples is a splendid success. The foliage remains sound and healthy, and the fruit also is looking superior to the unsprayed. After you left I did some spraying, about the middle of May, on some Limbertwig trees that (heretofore) specked and fell off badly. The fruit on the sprayed trees is doing splendidly; is twice as large as the unsprayed.

I have a couple of early apple trees near my house that have all specked for the last thirty years. I sprayed these one time. They are now ripening nicely, are about twice the usual size and not a speck on them. I heartily commend your work as being of incalculable value to the fruit growers of North Carolina. Respectfully,

(Signed) J. A. DULA.

Copy of letter from J. A. Dula, showing condition of sprayed trees October 7:

LENOIR, N. C., October 7, 1908.

DEAR SIR:—In regard to the apple trees your department sprayed last spring and summer, the foliage is still green and healthy and the apples still hanging on the trees, sound and free from worms and bitter rot. The variety sprayed is my seedling, Dula's Beauty. One-half tree was sprayed; the other half shed its leaves and fruit more than three weeks since, and the fruit is on the ground, rotten, and that is the condition of a large part of my orchard. I hope that the demonstrations in spraying on my place will emphasize the importance of spraying to obtain sound fruit. It is no longer an experiment.

Respectfully,

(Signed) J. A. DULA.

The two letters which follow are from Mr. I. G. Ross, who attended the Demonstration Institute at King, Stokes County, January 31, and, profiting therefrom, sprayed his apple trees for the first time. His statements show that the demonstrations were of value to him:

R. F. D. No. 1, WALNUT COVE, N. C., July 3, 1908.

DEAR SIR:—I can now see the benefit I have derived from spraying, and write to let you know what I have accomplished by it. My May, Harvest and June apples have fewer worms than they ever had before, and I had no knotty or one-sided ones. I think I can safely say I added 50 per cent to their value by pruning and spraying, for they are larger and smoother than ever before. I feel very grateful for what I learned from the demonstrations at King. My winter apples, especially Winesaps, are falling less than ever before.

Very respectfully,

(Signed) I. G. Ross.

R. F. D. No. 1, WALNUT COVE, N. C., October 7, 1908.

DEAR SIR:—My apple trees are still full of dark green leaves, and very few, if any, have fallen. I have the finest lot of apples by far that I have ever had, and fewer with rotten specks than ever before. From fifteen bushels of Winesaps gathered from my sprayed trees I did not get over one-fourth of a bushel of specked apples, and practically none were wormy. The Virginia Beauties showed a little rot, but I can safely say it was 50 per cent less than ever before. The Ben Davis fell off worse than any of the others that were sprayed, but showed no signs of rot. The Royal Limbertwig showed very little rot and hung on the trees until gathered, and as yet show no sign of rotting, although heretofore they have been very bad to rot. My neighbors say that I am well repaid for the money spent for spray pump and the labor of spraying.

Yours respectfully,

(Signed) I. G. Ross.

ASSISTANCE RECEIVED FROM THE U. S. DEPARTMENT OF AGRICULTURE.

Through the courtesy of Dr. S. A. Knapp, in charge of Farm Demonstration Work for the U. S. Department of Agriculture, the institutes are indebted to Mr. S. W. Hudson for his assistance at 24 institutes, and to Mr. E. S. Millsaps at 11 institutes. Through the courtesy of Senator Lee S. Overman and Congressmen Small, Page, Thomas and Godwin, the work is indebted to other employees of the U. S. Department of Agriculture, as follows:

M. O. Eldridge (office of Public Roads), 13 institutes.
W. W. Ashe (Forestry Service), 4 institutes.
D. A. Brodie (Division of Farm Management), 10 institutes.
C. L. Goodrich (Division of Farm Management), 4 institutes.

LECTURES DELIVERED AT WOMEN'S INSTITUTES.

On the following pages are three lectures delivered at the Women's Institutes during 1908.

WHY WE SHOULD ATTEND THE INSTITUTE.

By Mrs. J. C. Redfearn, Anson County.

When we consider the question of attending the meetings of the Woman's Institute, one naturally asks, "Why should I go? Of what benefit would it be to me?" To those of us who have attended the institutes, both in the county and at Raleigh, the advantages are very apparent.

The first and greatest reason why we should attend the meeting is because of the work that the institute is doing and hopes to do. The underlying principle of the work is the betterment of home conditions and the education of the woman in the home to higher ideals.

The institute is a convention of women who are deeply interested in home-making and housekeeping. It presents an opportunity for wives and mothers to come together and discuss subjects of mutual interest and benefit.

The ladies who have charge of the work have spent years in the study of domestic science and home economics, and are thoroughly capable of handling the subjects. They insist on the co-operation of the members by the exchange of ideas, and in this way we have an opportunity of profiting by the experience of others as well as imparting to them some suggestions that have been helpful to us.

It has been said that our home life is gradually slipping away from us, and how true it is that many of us are so busy with our daily struggle for making money that we lose sight of the fact that we owe a duty to our homes that cannot be measured by a monetary value. Right here is where the institute does some of its most effective work, in teaching the wives and daughters that the life that counts, the life worth living, is not measured by social success or lucky speculation, but is the busy, useful life whereby we do our part towards helping others to be useful and happy.

How important it is that we, as housekeepers, may meet together and learn from each other how the home life may be made fuller, more complete and more conducive to the happiness of its members; that we may learn to plan and systematize our work, use more conveniences for saving time and lightening labor, and, instead of our life being a daily grind of work, worry and dissatisfaction, find that many hours may be devoted to rest, recreation and improvement; that by attending these meetings we may catch the secret of considering our work ennobling instead of degrading, and in this age, when domestic help is hard to secure, that instead of admitting with reluctance that we do our own work, as if it were a sign of poverty, we may refer with pride to our well-regulated household.

Another great advantage of attending the institute is the knowledge to be gained of the subjects discussed. Perhaps you are interested in waterworks for your home on the farm (and we can have this luxury as well as our town friends), but we hesitate and put off taking any steps because we lack the necessary information, whereas by attending these institutes we may receive all the information we need as to cost and necessary equipments. There is a great deal being said just now on betterment work for schools. This subject also comes under the head of the institute work. At our State meeting in Raleigh this work was discussed by Miss Edith Royster. She told us of a community of ladies who wished to build up their school, and, lacking the necessary funds for the work, they rented some land and did all the work, except plowing, of making and gathering several bales of cotton. This shows what perseverance will accomplish.

To those who are interested in dairying this is an ideal place for information. All the improved utensils for handling the milk and butter are shown and suggestions given for marketing.

We also learn of the value of ventilation in the home, of the prevention of diseases, of home nursing and properly cooked food for the sick.

One of the most enjoyable discussions at our State meeting was on "The Country Woman's Spending Money," by Mrs. Boylin and Mrs. Smith, of Raleigh. In this discussion it was shown that nearly every article around the farm home is marketable if properly handled. These discussions are a great source of inspiration and encouragement to the woman who feels that she can do such a little towards providing small luxuries for the family.

Another interesting subject discussed was the importance of beautifying the home grounds. It was shown that with little expense so much improvement could be made by sodding the lawn in grass, the arrangement of a few well-chosen flowers, shrubs and trees, which would add material value to the property as well as afford great pleasure to both family and passerby.

To the mother who has but a few days to spend on a pleasure trip the State meeting of the Woman's Institute in Raleigh presents great attractions. The expenses are very small, and the trip can be made one of profit as well as great pleasure. In a social way it affords an opportunity of meeting the best and most earnest women of our State, women who are wide-awake and progressive, who are willing and anxious to do all that is possible towards upbuilding the homes of North Carolina and the education of her sons and daughters.

The city itself offers many attractions, being not only our capital, but also a city of colleges and other public institutions.

I hope to have shown by this review of the work that the Woman's Institute is an organization whose objects are helpful, whose aims are liberal and whose subjects for discussion are profitable, interesting and unlimited, and when it appeals to all persons of a community, bringing about a hearty co-operation, it may become a great source of education.

THE PREVENTION OF DISEASE IN THE HOME.

By Mrs. W. N. Hutt.

The big, strong man swings joyously along to his work, the happy mother hums a little tune as she performs her daily round of duties, and the children in the yard scream with laughter at the mere joy of play and sunshine and strong little bodies.

Do we appreciate this priceless treasure of health? Yes; the five wise virgins appreciate and guard it tenderly and the foolish ones learn its value only when it is too late. Let every Woman's Institute woman be a wise virgin, and, believing the old adage that "an ounce of prevention is worth a pound of cure," still fortify herself with knowledge for the day of sickness.

A medical journal recently made the statement that nearly all illness is the result of either carelessness or lack of knowledge, and so it is, as you will see, if you consider a moment. It may not be carelessness or lack of knowledge on your part, perhaps, or my part, or on the part of anyone you know, but that does not prevent you or your loved ones being the sufferers.

If we would value that "ounce of prevention" let us learn more and more to appreciate fresh air and sunshine, to never forget the virtues of water and to study the well-balanced diet—these three, the trinity of health.

Sometimes we forget that it is not just air we want—it is fresh air, air with plenty of oxygen in it, air to which the sunshine has given its golden touch. It would take too long here to explain just why oxygen makes for good red blood, and how that good red blood helps us to resist disease, but write this on your book of health: Have no shut room in your house; faded carpets are better than faded health; never allow a day to go by, winter or summer, in

which at least one window of each room is not opened for a while. Do not believe that the air is not purest when it is raining. Does not God know what is best when he sends the gentle rain from heaven to wash out its particles of dust and its gases and impurities?

Then there is that old superstition of night air being bad. Sit down and think it over and then decide whether or not you want every bedroom window open at night. Again, do not forget that there are everywhere germs and microbes, so small that it takes a powerful microscope to see them. For the good of our health it is good for many of these germs to die, and few of them can live longer than thirty minutes in the sun and wind. Therefore put your feather beds and pillows to sun, and you are not apt to wonder "how Lucy got the scarlet fever so long after Willie was well. She must have gotten it somewhere else."

Water. Ah, the Creator knew what was best for his children when he gave it in abundance. Take a glass of it first thing in the morning, for it flushes out the intestines and, being somewhat of a shock to them, spurs them to action, often making pills less necessary. Hot water is a good stimulant and cold is a tonic.

Our third member of the "trinity," a well-balanced diet, is too long a subject to discuss here other than to say there is nothing more important in the household.

Once there was a time when the wisest of the savants of the world did not dream that there were animals and plants so small that our eyes would not see them. Now we know that there are, for even an ordinary microscope will reveal some of these germs or microbes to us. Some of them are our friends, but they are of vital interest to us, because they are sometimes responsible for our crop failures, for the spoiling of our foods, and because they are the cause of many diseases. To learn the causes of diseases is to prevent them.

Tuberculosis is caused by a germ that may live in almost any part of the body. In the hip it may be called hip disease; the skin, lupus; the spine, spinal disease; then there is scrofula, white swelling, quick consumption, etc., but the germ, wherever or however it may have entered the body, usually finds its way to the lungs, where it is called consumption. So prevalent is this consumption that one out of every four persons between the ages of fifteen to forty—the age at which they are useful to the world—die of it; one out of every seven deaths in the United States is due to it; so dreaded is it that it is called the Great White Plague, and a congress of the world's greatest doctors was recently held to try to save us from it.

It is contagious, and we get it by repeated contact with the person who has it, with the place he has occupied or with the things used by him. It may be cured at first, when we make ourselves think it is only a cold or bronchial trouble, but it is well-nigh incurable when it has made deep ravages.

For the patient, give him plenty of fresh air and sunshine, letting him live out of doors by day and sleep in the breezes by night. Do not fear draughts, simply protect him from any directly on him. Give him all he can eat of milk, eggs, fresh fruit, nuts, good, tender, rare beef, and, instead of the usual three meals, let him take something nutritious but easily digested every two hours, if possible. Also give him regular rest and, if there is not a tendency to hemorrhages, regular exercise also. So many sick people are inclined to settle down and neglect it, when they are not able to perform their regular work.

I might supplement this with be cheerful when with him, and do not spend one cent for advertised cures. Don't kiss him. Tuberculosis is frequently spread through the sputum, so the main point in prevention is to destroy the spit, for it has millions of these tiny living germs in it. Let the patient spit in rags and burn them, or, if that is not possible, soak them in five per cent carbolic acid, and after boiling hang them out exposed to the sun. If he spits in the cuspidor, keep some good antiseptic in it; a tablet of bichloride of mercury dissolved in a quart of water is a good one. He should cough or sneeze into a rag. Never let a well person sleep with him, if possible, nor in the same bed clothing after he has been in it; sun the pillows and mattresses and air the room well, for the germs will live long in curtains and sofas and walls. Hardly a day passes but we see some person disregarding these rules, but if men understood the reasons for them, I do not believe a being exists who would do aught to cause suffering to those he holds dear.

Diphtheria is very, very contagious and lives for months and is often carried far. The excretions from the nose and throat contain the germs, so don't let a child go near a person with sore throat, don't kiss anyone with sore throat, don't drink from the same cup or blow the same whistle, don't handle the clothing worn by the person, don't let a cat or dog in the sick room, and don't fail to disinfect the bed clothing: two per cent carbolic acid and boiling are good.

Typhoid is another of our dreaded diseases, especially in the rural districts. Usually we get it through the medium of water. After swallowing the typhoid germ it remains in the intestine from ten to twelve days before making itself definitely felt. There it multiplies enormously, and from the time the germ is drunk till weeks after convalescence thousands of them are in every discharge of the bowels. By this means they get on the soil, and being tiny plants, loving darkness and warmth and moisture, they remain there alive a long time. Rain comes and they are washed into the wells, where again they begin their work of destruction. The remedy, therefore, is not quarantine, but disinfection—that is, to kill the typhoid germ in the discharges, both liquid and solid. Chloride of lime is good, and should be allowed to stand in the vessel at least half an hour before emptying. Then care should be taken to empty it far from the well, and a covering of lime is a good extra precaution. Soak the bed clothes in two per cent of carbolic acid and boil. Care that no such contamination can possibly get in the well should be a first consideration.

Sometimes we get typhoid through the milk. Pans and pails are washed in contaminated water and then the germs find a happy home in the milk. Boil the dishes and spoons after the patient is through with them. Epidemics have started in which oysters and vegetables were the mediums, but this happens rarely. A very common source of contamination is through the agency of flies. Not only is this true of typhoid, but of many other of our diseases.

By care and diligence almost anyone can rid herself of flies, because they do not travel far. The thing, therefore, to do is to prevent the exposure of fresh horse-stable manure in your vicinity. Have the outhouses well protected from flies and, where possible, sprinkle lime and sand over the top. The piles of manure in the stables are a favorite breeding place, and since it is ten days from the time the fly lays the egg till it is again a fly, keeping the manure in a tight box and removing it once a week will do much to check their spread. Where this cannot be done, sprinkling the stalls with a five per cent solution of carbolic acid occasionally will help to remedy matters. The fly lights on the germ-laden manure and, with its hairy legs, carries hundreds away to deposit them in baby's glass of milk or on the food we are eating.

Malaria, chills and fever, ague, which is the same thing, is an infectious disease. We cannot get it directly, but we do contract it through the agency of one particular kind of mosquito. Not all mosquitoes are capable of carrying malaria, but one light, frail, almost noiseless kind, with hind legs so long that it looks as though it were standing on its head when it bites, is the guilty creature. The malaria germ is in the blood, and the malaria mosquito bites the person and sucks in the blood and with it the germs. The germs fasten themselves on the intestine of the mosquito, remain there a while and at last find their way into its salivary glands. Again it bites a person and injects, with the saliva, the germs into the victim, where it is taken up by the blood. The germs get into the red corpuscles, where they remain for twenty-four hours, sometimes thirty-six, before coming out and, by the presence of their poisons, producing the chill of malaria. The question is, What can be done to prevent mosquitoes? Mosquitoes lay their eggs in stagnant water, where they hatch into "wigglers," swimming around and having a gay life, coming occasionally to the surface to breathe. The thing to do, obviously, is to allow no stagnant water, or else to prevent their coming to the surface to breathe. As a remedy for the first, watch any little pools, all old cans, etc., and for the latter cover the surface of the water in the old rain barrel or pool with a little skim of kerosene.

JUST A FEW DON'TS.

Don't use patent medicine.
Don't darken the sick room; just shade the patient's eyes.
Don't think it extravagant to pay fifty cents for a thermometer.
Don't forget to be cheerful, even though it be at the cost of an effort.

"It is easy enough to be pleasant
When life flows along like a song,
But the man worth while is the one who will smile
When everything goes dead wrong.
For the test of the heart is trouble,
And it always comes with the years,
But the smile that is worth the praise of earth
Is the smile that comes through tears."

A TALK ON FOODS.

By Miss Nellie W. Cobb, Goldsboro, N. C.

It is said that what we all need to know is what to eat, when to eat, and how much to eat. Sick people must have a special diet, prescribed, as a rule, by a physician; but the rest of us need only be concerned with what foods will keep us well, strong and healthy.

"Food is that which builds up the body and furnishes heat and energy for its activities." In other words, it must build up new tissue, muscle, bone and nerve, as for the child, and repair that which is worn out by constant use and exercise. It must also furnish heat to keep up the normal temperature of the body and to give it ability to do work.

Now, it has been found out by those who have given the matter careful study that there is only one foodstuff that will furnish these three things; that food is milk, which is suitable for the growing child and for the sick, but not as the only article of diet for the adult. The appearance of teeth in the child is nature's indication that solid food is needed. The analysis of milk shows that there are five different food substances contained therein. From this we know that our food should supply all these substances, which are (1) protein, or the body-building substances and repairers; (2) fats, and (3) carbohydrates, the heat and energy-giving substances or fuel foods; (4) minerals, or bone-building substances, and (5) water, the "carrier" of the body.

History tells us that primitive man lived on nuts, berries, roots and the animals found nearest to his dwelling place. As civilization has advanced and facilities for travel by land and by sea have increased, our markets have become filled with products from nearly all parts of the earth. And so it has come about that we of to-day have such a wealth of food materials at our command that it is difficult to know what to select. Then, too, we have lost our early instincts and no longer possess a normal appetite. How important it is, then, that we study the "food question" and learn to select wisely, to prepare and serve the foods that go to make up a wholesome diet. Someone has said that the housewife holds in her hands the destinies of the members of her family—another way of saying "If you will tell me what you eat, I will tell you what you are." It behooves us, therefore, to prepare for this great responsibility.

First, we will look for food materials that are body builders. Protein is the only food element that can do this important work. It can also yield heat and energy, but at too great a tax on the organs of digestion and also on the purse. Lean meat, fish, eggs, milk, cheese, peas, beans and nuts are examples of food rich in protein.

Fats are supplied by butter, cream, fat of meats, olive oil and cotton-seed products.

The vegetable kingdom largely furnishes the carbohydrates (starches, sugars and gums). Milk (containing sugar) is an exception. The cereals, rice, corn, potatoes, tapioca, fruits, beets, honey and syrups are some of the food materials which give us the carbohydrates. Such vegetables as cabbage, turnips, celery, lettuce, spinach, asparagus, green beans, eggplant, squash, tomatoes, cucumbers, etc., supply the much-needed minerals and acids and a part of the water. Small quantities of mineral water are found in all food materials. Salt is the only mineral substance that man adds to his food.

A pure form of water comes from the fruits and melons, but this is not sufficient to supply the body. Rain water, deep and shallow wells, springs, rivers and lakes form the other sources of the body's great "carrier." Water forms about three-fourths of the weight of the body; it is not, however, considered a nutrient. It dissolves foods and helps carry them through the body.

We do not eat as food pure starch, fat, protein, etc.; neither do we as adults find it advisable to live on one article of diet. By so doing we would get too much of some food substances and not enough of others. It is not well, for most of us, at least, to live on one class of food materials and be strict vegetarians. The arrangement of our digestive organs verifies the latter statement. All things being considered, a "mixed diet" is best for the normal adult.

There are few food materials that do not contain a little of each of the five food substances; so that without much thought or planning we get a certain amount of all in our daily food.

Green vegetables have not the nutriment found in the grains and most of the tubers, but they are valuable because of the phosphates and salts they contain and which our bodies demand. They dilute the more highly concentrated foods, as meats, eggs, etc., and give variety.

Fruits are refreshing, stimulating and sometimes nourishing. They help to keep the blood in good condition.

The fats and carbohydrates (starches, sugars and gums), besides being fuel foods, give needed bulk and help to keep the organs of digestion in good order. Vegetable foods take a longer time to be digested and require a more active outdoor life, and in that way are also greatly beneficial. The excess of fats, and starches and sugars, too, is stored as fatty tissue, to be used in "hard times" and drawn on when the food supply is low.

The foods supplying protein are essential to life itself. Upon these alone we could live, but by so doing our diet would be too highly concentrated and stimulating.

From the above we have seen something of what is called the "relative nutritive value" of foods in the raw state. The preparation, combination, cooking, serving and digestibility all help to determine the nutritive value of foods.

Food is largely affected by cooking. As an instance, we might have a nice piece of juicy, tender steak, which in its raw state is an unfailing source of strength-giving material. If this is badly cooked—overcooked, we'll say—and rendered tough and indigestible, its strength-giving property or nutritive value is greatly reduced. Again, the best of flour and other ingredients are at hand for making bread. If this is not properly made and baked, if it is sad and heavy, instead of giving the body its valuable force it may become what a famous teacher of cookery calls "the staff of death."

The housekeeper may so combine her articles of food that she will greatly lessen their value, if not entirely destroy it. For example, the mixing of fruits with pastry in pies, dumplings, etc. Then, if these are poorly cooked, the result will be a still greater tax on the body to change such combinations to a liquid that can be taken up by the blood. Such foods retard digestion and use up a good part of the body's energy that might be turned into mental and physical pursuits, to say nothing of the wear and tear they give the body, and the consequent headache and dullness that often follow.

The preparation and serving also plays an important part. A meal that is prepared and served by a person who disregards the rules of cleanliness by not removing the "visible dirt" from food and utensils, the table and its settings, will in large measure affect one's appetite. Dainty ways of serving food and tastefully garnished dishes are pleasing to our "aesthetic sense" and often stimulate a flagging appetite—"make the mouth water"—a very important consideration, from a physiological standpoint.

Under this head, too, should come the effort to rid the food of harmful bacteria, disease germs, worms and other parasites. Food and drink may be, and often are, the carriers of dangerous disease germs. The careful washing of fruits and raw vegetables is a precaution we should all observe. The heat of cooking frees most foods from these germs. If there is any doubt about the purity of the drinking water, it, too, should be boiled or distilled. The "flat taste" so objectionable in boiled water may be easily overcome by pouring the boiled water from one vessel to another several times, out in the fresh air where there is no dust flying.

The condition—physical and mental—of the person who is to eat the food is to be considered. Any great excitement, as fear, anger, joy, grief, so affects the digestive system that the food eaten is arrested in its digestion, and often serious illness results. "Laugh and grow fat" here finds adequate expression. When one is very tired it is not well to eat heavily. After partaking of a very hearty meal, one should avoid taking violent exercise or a bath immediately. By so doing the blood is taken from the stomach.

The manner of eating must not be overlooked. Food that is rapidly eaten, not well chewed, is usually washed down with some liquid, loses for us a good part of its nutriment, also takes a longer time to be digested. Mr. Gladstone, one of the greatest men of England, well-rounded mentally and physically, was a great advocate of thoroughly chewing the food.

Food is also to be reckoned with from the standpoint of digestibility. Food is digested or, to express it in general terms, is dissolved or changed into a liquid form by certain organs set apart for this work. Now, for what purpose does it undergo this change? In order that it can pass through the very thin membranes of the small blood and other tubes and be carried by the blood to all parts of the body. It is indeed true that "we live not upon what we eat, but upon what we digest." From this it can be readily seen that a food that is easily and quickly digested—provided it is rich in nutriment—has a much higher food value than one not possessing these qualities.

Surely the building up and care of the body should not be left to chance. We all admit that the farmer should know how much hay and other feeds to lay in store for the feeding of his cattle. He must see that they thrive, and at the same time there must be no waste of feed by supplying too much or that of a poor quality. It is far more important that the housewife should know what foods to provide for the members of her household; also the right proportions and combinations of food substances, and how to substitute one food material for another without decreasing the nutritive value of the diet. She, too, should learn to be economical in the right sense; she should know of what "true economy" consists. It does not mean doing without things that are necessary to health, but it does mean a wise selection and preparation of foods. It means *no* wasting. The great difficulty with most housekeepers is that they are apt to serve too many kinds of food at one meal. One person does not have the time or skill to properly prepare so many different dishes. Fewer foods, simply cooked and well served, would mean better economy and better health. This, too, would provide for the variety that is so much needed.

If at one meal we have rice, potatoes (Irish and sweet), maccaroni, peas, beans, two kinds of meat and one or two kinds of bread, what is left for to-morrow's dinner? The rice, potatoes and maccaroni all supply starches; the peas and beans, also, are two vegetables of a kind.

It is sometimes necessary to provide food for the family at the lowest possible cost. To do this it is necessary to know what foods can be substituted one for the other; then to compare the relative cost of each. We must get rid of the idea that "a cheap food is a poor food." Often the cheaper cuts of meat contain as much nutritive value as more expensive ones, and can be made palatable and attractive by a wise exercise of the art of cookery.

By referring to the lists of food materials given under each of the five food substances we may easily find what foods can be interchanged; also at what reduction of cost. Meat, given at the head of the protein list, is usually an expensive food. Eggs make a good substitute, but here one must be governed by the price of eggs. When they go down to fifteen cents per dozen we can well afford to use them in the place of meat. Their food value is very great. The digestibility of well-cooked eggs is high. They can be cooked in many different ways, besides being a necessary ingredient of many dishes.

Fish affords another example of meat substitutes. It has this advantage over eggs—it is cheap, for "Nature does the feeding, and we have only to pay for the catching." Fresh fish should be used freely in the season it is cheapest and best. Fish is easily digested and is recommended for people who take little exercise. For people who live inland, salted and smoked fish form a valuable food. Corned mullets or corned mackerel soaked over night make a nice breakfast dish. They may be either fried or broiled. Then there are the packages of codfish, which can now be bought already "flaked." Codfish mixed with mashed Irish potatoes, shaped into cakes or balls and fried gives another good breakfast dish. Sardines should not be overlooked. They come "ready to eat," and so save the housewife's time and energy. They can be quickly served when an unexpected guest arrives at meal time.

Cheese is another meat substitute. In America, unfortunately, it seems to be regarded more as a luxury than as a staple article of diet, yet one pound of cheese is equal in food value to two pounds of meat. It is rich in both protein and fat. Considering this, its price is very low, and it ought to do good service in the place of meat. Its food value is fully recognized abroad. In Switzerland, and, to a great extent, in Germany and Italy, cheese is a part of the daily food given to the outdoor laborers in the place of meat. A great advantage in using cheese, and one that should appeal strongly to the overworked housewife, is that it is generally given uncooked. There is some doubt as to the digestibility of cheese. It is claimed by noted German scientists that, when taken in the usual quantity—from one-fourth to one-half pound daily—and by people who lead an active outdoor life, it is about as easily digested as meat. For the average person, who takes but little outdoor exercise, cheese is hard to digest. This is true of most kinds as purchased in our market, but the homemade cottage cheese, often called clabber cheese, is an exception. This dish is easy to prepare and is very economical where there is a home supply of milk. It is a good way to use up the overplus of sour milk on the farm. Cottage cheese makes a nice tea or supper dish, and is so palatable and nutritious that I will give the recipe.

COTTAGE CHEESE RECIPE.

Place sour milk in vessel on back of stove and let it warm gradually. Take care that the milk does not become *hot*, as this will make the curd tough and hard to digest. When the curd is separated from the whey—a process hastened by the application of heat—pour into a bag and let drip until the whey is removed. Turn curd into a dish, season to suit taste with salt and pepper, mould into little balls or pats, or stir with a fork, then pile lightly on dish. A little cream may be added to the curd along with the seasoning.

The vegetable foods—peas, beans, lentils and nuts, particularly peanuts—that may in a measure supplant meat, should often be found on the table. The peanut paste or butter made from finely ground nuts is pleasing to the taste and very nutritious. Peanut-butter sandwiches make a wholesome lunch for school children. We Americans are said to eat too much meat. Since it forms the most expensive part of the diet, it would be well, from an economical standpoint, too, to often replace it with some of the above-named substitutes.

It is the duty of the housewife to furnish a well-balanced diet to the members of her family. By taking something from each group of food materials she will be able to supply all of the five food substances—protein, fat, carbohydrates, minerals and water—which are necessary. The correct proportions of each, however, must be determined by the individual requirements and peculiarities. Appetite, age, sex, occupation, climate and season must all be considered when making a well-regulated diet for the normal person.

This parting injunction is given in one of the *United States Farmers' Bulletins* by Professor Atwater:

"It should always be remembered that 'the ideal diet is that combination of foods which, while imposing the least burden on the body, supplies it with exactly sufficient material to meet its wants,' and that any disregard of such a standard must inevitably prevent the best development of our powers."

STATE FARMERS' CONVENTION.

(ROUND-UP INSTITUTE.)

HELD AT THE A. AND M. COLLEGE, WEST RALEIGH, AUGUST 25, 26, 27, 28, 1908.

The State Farmers' Convention was organized five years ago through the efforts of the Faculty of the Agricultural College and a few others interested in agricultural progress. At the annual meeting of the Convention, July, 1906, it was affiliated with or made a part of the Farmers' Institute work conducted by the State Department of Agriculture, and the State Director of Farmers' Institutes made the Secretary of the Convention.

This convention was intended to be, and virtually is, a four-day Farmers' Institute. Its aims and purposes are educational, and in preparing the following program, instruction more than mere amusement was the object in view.

While the money available would not permit of the securing of high-priced speakers and teachers from abroad, a glance at the program cannot fail to convince anyone that those who attended were well repaid in knowledge acquired, inspiration, encouragement received and pleasure obtained from mingling with those engaged in similar lines of work.

This should annually be the largest meeting of farmers held in the State for the study of strictly agricultural problems, and all farmers who can possibly do so should certainly attend and take their families. The program for the women was also an attractive one, and, with all members of the family thus provided for, this State Convention should be made the occasion for giving all the grown members of the family an annual trip combining pleasure and profit at a minimum cost.

In a report of this kind it is manifestly impossible to give a complete statement of the proceedings of the Convention. The many most excellent discussions, and also a large number of the splendid addresses or lectures, are of necessity omitted. As an index of the character of the work of the Convention, the program which was carried out and a few of the lectures given at the women's and dairymen's meetings are printed on the following pages.

PROGRAM SIXTH ANNUAL MEETING NORTH CAROLINA STATE FARMERS' CONVENTION, NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS, RALEIGH, N. C., AUGUST 25, 26, 27, 28, 1908.

Tuesday, August 25.

MORNING SESSION.

10:00.—Convention called to order by President H. C. Dockery, Rockingham.
Enrollment of those present.
President's Address, by H. C. Dockery.
The Future of Agricultural Education in North Carolina, by D. H. Hill, President N. C. College of Agriculture and Mechanic Arts.

AFTERNOON SESSION.

2:00.—Observations and Conclusions Concerning Certain Farm Practices, by T. J. W. Broome, Union County.
Discussion:
The Soil Water and Its Management in the Production of Crops, by W. A. Petree, Stokes County.
Commercial Fertilizers: When, How and Why Use, by C. B. Williams, Director N. C. Experiment Station.
The Results of Feeding Stuffs Inspection, by C. D. Harris, Feed Chemist, State Department of Agriculture.

NIGHT SESSION.

8:30.—The Building of a Nation, by Dr. S. A. Knapp, in charge of Farmers' Co-operative Demonstration Work, U. S. Department of Agriculture.

Wednesday, August 26.

MORNING SESSION.

7:30 to 10:00.—Live-stock Judging:
Cattle—John Michels, Professor Animal Husbandry, N. C. College of Agriculture.
Hogs—R. S. Curtis, N. C. Experiment Station.
Horses—Dr. W. J. Hartman, Assistant Veterinarian, State Department of Agriculture.
Commercial Fruit Culture in North Carolina, by F. C. Reimer, Horticulturist, N. C. College of Agriculture.
Discussion:
Commercial Apple Growing in Western North Carolina, by W. N. Hutt, Horticulturist, State Department of Agriculture.
Discussion:
Marketing Horticultural Products, by S. B. Shaw, Assistant Horticulturist, State Department of Agriculture.

AFTERNOON SESSION.

2:00.—The Parts of a Flower, and Their Use in Cross-breeding, by F. L. Stevens, Biologist, N. C. College of Agriculture.
Discussion:
Cotton Breeding, by C. L. Newman, Agriculturist, N. C. College of Agriculture.
The Value of the Pure-bred Sire, by Dr. W. J. Hartman, Assistant Veterinarian, State Department of Agriculture.

NIGHT SESSION.

8:30.—Character Building in the Farm Home, by Mrs. Sue V. Hollowell, Goldsboro.
Agricultural Education, by Prof. W. J. Spillman, U. S. Department of Agriculture.

Thursday, August 27.

MORNING SESSION.

7:30 to 9:30.—Dairy Demonstrations—College Dairy.
9:30.—Results Obtained by Dairy Demonstration Work in North Carolina, by J. A. Conover, U. S. Department of Agriculture.
Discussion:
Practical Scientific Farming, by A. L. French, Rockingham County.
Discussion:
Destructive Insects—The Consideration They Should Receive by the Farmer, by Franklin Sherman, Jr., Entomologist, State Department of Agriculture.

AFTERNOON SESSION.

2:00.—Pure Drinking Water on the Farm, by Dr. J. M. Pickel, Raleigh.
Insects Injurious to Garden Crops, by R. I. Smith, Entomologist, N. C. College of Agriculture.
The Examination of Horses for Soundness, by G. A. Roberts, Veterinarian, N. C. College of Agriculture.

The officers elected for the ensuing year are: President, A. L. French, Rockingham County; Vice President, T. J. W. Broome, Union County; Secretary, Tait Butler, Director of Farmers' Institutes.

WOMAN'S DEPARTMENT, STATE FARMERS' CONVENTION.

For several years the meetings of the Woman's Department of the State Convention have been of great value to those interested in the improvement of rural conditions, and the following program will show that the meeting this year was no exception to the high standard set by previous meetings.

WOMAN'S DEPARTMENT NORTH CAROLINA STATE FARMERS' CONVENTION, AUGUST 26, 27, 1908.

PROGRAM.

Wednesday, August 26—10:00 A. M.

The Aims and Purposes of this Meeting—Mrs. W. N. Hutt, Chairman of the Woman's Branch of the State Farmers' Convention.

Address of Welcome—Mrs. W. S. Primrose, President of the Raleigh Woman's Club.

The Value of Fresh Air—Mrs. E. E. Moffitt, Raleigh.

Amusements and Recreation for the Children—Mrs. W. R. Hollowell, Goldsboro.

Address by Dr. S. A. Knapp, United States Department of Agriculture.

Wednesday—2:00 P. M.

The Country Woman's Spending Money—Mrs. James G. Boylin, Wadesboro.

The Country Woman's Methods of Earning Money—Mrs. W. Wise Smith, Raleigh.

The Mother as a Source of Inspiration to the Child—Mrs. Frank K. Elam, Cleveland Mills.

Thursday, August 27—10:30 A. M.

Improvement of the Farm Home—Mrs. F. L. Stevens, Raleigh.

The Woman's Association for the Betterment of Public Schools—Miss Edith Royster, Raleigh.

Simple Plumbing in Rural Districts—G. L. Vinson, Raleigh.

Bee-keeping as an Occupation for Women—Mr. Womble, Raleigh.

The Woman's Branch of the Farmers' Institute—Dr. Tait Butler, Director of Farmers' Institutes for North Carolina.

On the following pages will be found a few of the papers read at the meeting of the Women's Branch of the State Farmers' Convention, August 26, 27, 1908.

THE AIMS AND PURPOSES OF THE WOMAN'S BRANCH OF THE FARMERS' INSTITUTES.

By MRS. W. N. HUTT, Chairman of the Woman's Branch of the Farmers' Convention.

Ladies:—I have this morning the delightful task of welcoming you, in the name of the State Department of Agriculture, to our Capital City. We, as an organization, have much to strive for and much to obtain. The object of the work of the Department of Agriculture is the upbuilding of the State. The object of the Farmers' Institute division of the Department of Agriculture is the encouraging of men to form a copartnership with nature that we, nature's children, may enjoy the fruits of the earth and the fullness thereof. The object of the Women's Institute is to so touch the home life of the people as to make for a higher standard of manhood and womanhood, that in the years to come this State of North Carolina shall bring forth sons and daughters that shall be leaders of men in the paths of intellectuality, usefulness and helpfulness, than which there is no nobler mission under the sun.

We want men to better comprehend woman with her hopes and inspirations and devotion. We want women to understand more fully the goodness and

kindness of purpose that prompt men in their daily acts and to realize that it is woman's place to know her business of homemaking with its thousand duties just as much as it is man's duty to make the money for that home; to know as much about the gluten in the flour that makes their daily bread as the husband knows about the nitrogen in the fertilizer; to know how to make scraped beef when the child is sick as well as he knows how to tend the cattle; to know the cause and prevention of typhoid and to have a knowledge of those little labor-saving devices for the kitchen, the most expensive of which in the home are less dear than the cheapest of those used for man's work in the field. The only means that the average busy, tired mother on the farm has of gaining this knowledge is through the Woman's Institute, and she does not get that unless she attends the meetings.

The work of the Woman's Branch of the Farmers' Institute has met with warm approval and hearty enthusiasm through the State, as is evidenced by the fact that in 1906 there were twenty-one institutes held and this year seventy-four, with requests for more from every quarter. The women are just waking up to the great advantages to be derived from attending the institutes.

There are three classes of people whom we women of the State wish to reach: first, the legislators, who are the husbands, fathers, brothers and sons of ourselves. Our work being new it is not strange that they do not understand its purposes. When we bring to them a knowledge of what is being done in a definite, practical, first-hand manner by things learned, by lessons applied, there will be no trouble in getting legislators to lend their aid in extending this great work. In Ontario the members of the Legislature think so highly of it that where the women of a county band themselves into a local Woman's Institute the government gives them a grant of money to defray expenses.

Secondly, there are the men whom we need to have realize that they need our aid in all things, where the home and children are intimately affected. We have an example of how small, narrow and short-sighted the men of a community can be, right here in our own State. In one of our counties the men took little interest in having a good school for their own children, not having sufficient education themselves to realize its advantages, and a woman—free, talented and a money-maker—came in and worked until the school was provided. The men were so pleased that they wrote to Raleigh asking if it was legal to put her on the school board, and when the answer came, "The law says 'he' and 'him,' and not 'she' and 'her,'" they said they would defy the law and put her on the school board, for it was nothing but right. They did put her on, and so efficient was she, so progressive, that the devil stepped in and said: "She makes better use of her brains than you men, she is more progressive, she is trying to build your children into noble men and women in spite of you, and hark, my children, she is making more money than any man of you, so cast her out, cast her out"; and these men, exulting in the manly, noble privilege of a free country, cast their votes against her, and did their utmost to stem the tide of progress. She was like a big toad in a very little puddle—she stirred up much mud and exposed the hidden, harmful germs of ignorance to the sunlight that kills.

Let us, as women, when we see any evidences of smallness of spirit on the part of man, or woman either, realize that without progress our children are not going to take their places in the great and ever-increasing tramp, tramp, tramp of humanity. There is no such thing as standing still; if we are not going forward we are going back, for, as Tennyson says, "The lives of men are widened by the progress of the suns." Above all things, let us make up our minds to accomplish our purposes, not by arrogance and combativeness and ill temper, but by sweetness, kindness and appeal to the reason of man.

Third. Let us realize that we come together more as teachers than as students. The army manual says that to be a good commander you must be a good soldier, so to be a good teacher you must be a good student. Let us come together as students and go forth as teachers; teachers in our own homes by example; teachers to our neighbors by word and helpfulness in time of need, and teachers to all the world by word and helpfulness and example in all that is of lasting benefit.

One thing I wish to emphasize, and that is the lack of development of local talent. I hope it will be but a very few years before local talent will be so utilized that to the country women will belong the organization, and then, instead

of the Department sending out speakers, the local organization will but appeal to the Department for specialists along whatever lines it at that time deems helpful. The best good can be accomplished only by the scientifically trained worker joining hands with the one whose information is gained by practical experience.

In the matter of labor-saving devices I have a few words to say. Where do you think your home farm would be to-day in comparison with the neighbors' if the only devices used were an old wooden plow and a mule? Many of the kitchens on the farms, as compared with the modern kitchen, is as that farm compared to a fine one in which machinery accomplishes what muscle could never do.

The kitchen is the workshop of the home, and the worker in it must have the proper tools if she is going to accomplish the greatest amount of work with the least expenditure of labor. If a man can have improved plows, harrows, etc., which cost many dollars, we can have a Blue Flame oil stove, the largest and finest of which costs $12.50, or a good range, or a washing machine and wringer for $8.50, oilcloths for the tables at twelve and one-half cents a yard, and the various graters and squeezers, which seldom cost over ten cents.

There is one matter to which I wish to draw your attention, and that is the necessity for interesting the young women in the work. They are the future homemakers, the wives of our sons and the mothers of our grandchildren. Encourage them to feel that they are a very important part of the organization, that they may consciously or unconsciously realize the dignity of home labor and the futility of going forth to be teachers or helpers in cities when their labor and brightness are more needed at home.

We cannot make our girls enjoy kitchen work until we make kitchens brighter and work less arduous. We cannot accomplish that until we make use of labor-saving devices, and we cannot get those until we have either obtained incomes of our own or succeeded in making the men see things domestic in the right light. And how woefully ignorant most men are of things domestic! If more men recognized the ability and strength it took to properly manage home perhaps more wives would have heart to make more effort. Men like to poke fun at woman's ignorance of business. Is it one-tenth as great as the dense ignorance of most men of matters pertaining to the work of the home? When any man realizes that the time saved from washing black pots and scrubbing bare boards will be spent in bringing up his children properly, in making home brighter, and in keeping herself bonnie for him, he will be glad to succumb and let her use her judgment in her own province.

A girl's ideal at seventeen
  Must have fine eyes,
Likewise a bold and striking mien,
  And faultless ties.
But later on her fancies roam
To one who'll bring his wages home.

A man's ideal at seventeen
  Must be a sprite,
A dainty, fluffy little queen
  Of sheer delight.
But later on he sort of feels
He'd like a girl who can cook his meals.

The woman who goes to the meetings will gain a knowledge of diseases, their cause and prevention, helps in the upbringing and educating of her children, a practical knowledge of the laws of hygiene; in short, a knowledge of homemaking and home keeping.

Like the little woman who said, "I never did do outside work, but I came to realize that I just had to go outside to know what was going inside my baby," let us use our own brains in deciding for ourselves the right of any moral custom in the community, and throw all our weight on the side we believe to be right. When we get to heaven the great book of life will not show how many times we used our influence on the side that was popular in the home, but it will show whether or not we used our influence for good or bad. Let it be good.

A French writer says: "If we would upbuild our nation, let us educate the mothers of our future sons." A superintendent of institute work puts it more beautifully than I can when he says: "Although we hear of political corruption, and betrayals of trusts, and frauds in business, we can place every confidence in the stability of the nation when the best mothers and daughters meet together in large numbers, with a common object in view—the betterment of the home and the advancement of the nation—'For Home and Country.'"

BEE-KEEPING AS AN OCCUPATION FOR WOMEN.

By Walter L. Womble, Raleigh, N. C.

Of the various industries in the State of North Carolina, bee-keeping could, with intelligent management and the expenditure of a little energy, be made to pay handsomely with less outlay of capital and time than anything else I know of; and of the various classes engaged in bee-keeping, the "woman on the farm," it strikes me, is the one best fitted to push this industry to the front.

In the first place, nature, as a rule, provides her with a good field, and this, combined with study and energy, will, under favorable circumstances, yield her quite a little income annually.

Do not understand me to say there are no ups and downs in the business, that all is clear sailing, that you will make money every year and plenty of it, regardless of the kind of bees you keep, the boxes you use or the section you live in, for such will not be the case.

Bee-keeping, as an occupation for woman, has its objectionable as well as commendable features, and for this reason I would not advise any woman to adopt it as an occupation until she is satisfied beyond a doubt that the section in which she lives is well fitted for bee-keeping. It is also necessary that she herself should have a taste for the business, otherwise I would not advise her to engage in it at all.

It is true, there are women in our State who have made quite a success financially as professional bee-keepers; but such cases are very rare and the sections in which they live are exceptionally fine for the production of honey. This is not said to discourage bee-keeping as an occupation, but as a profession.

While there are some whose locations are especially adapted to bee-keeping and who make handsome incomes annually, there are others who, with the same expenditure of labor and capital, owing to the unsuitability of their locations, make little or nothing. Hence, the location has more to do with successful bee-keeping, according to my way of thinking, than anything else. For instance, there are sections of our State where from 200 to 300 colonies of bees may be successfully kept in one yard, owing to an abundance of good honey-producing plants, while there are others where not more than a dozen may be kept profitably.

The proper method is not to invest too heavily at first. Two or three or four colonies of Italian bees in improved or movable frame boxes are sufficient to start with. Then subscribe to some good bee journal and study the business—study it *hard*. Test your field thoroughly, and add no more colonies to your yard than the field will support and give you a fair surplus under ordinary circumstances. When you have reached this point you can sell your increase (if you keep good, pure-bred stock) and add quite a nice sum to your income annually. If you keep good stock and advertise it, you will have no trouble in selling it at a fair price. And right here I will say there are more ways than one to get money out of bees. There is just as much money to be made from the sale of queen bees as there is from the sale of honey, and in a dull season, when there is not much honey made, you can divide your stock, build them up and sell off the surplus and still have as many or more

colonies than you started with for the fall or next spring honey crop. Artificial division and queen-rearing can both be very readily learned by anyone that has a taste for bee-keeping, and by these methods a nice little sum may be picked up annually by the farmer's wife or daughters.

If you wish to make a success with bees, do not start with black bees in box hives. If you do, you need not expect to succeed. Purchase one or more boxes of Italian bees in improved boxes, and start right. There is just as much in the stock of bees as there is in well-bred cattle, or anything else. The Italian bee was imported from Italy many years ago, and, after undergoing most thorough tests by expert bee-keepers, has long since been pronounced and recognized as the best all-round, general-purpose bee in the world. You will make no mistake in buying the Italian, either the three-banded, five-banded, golden, or leather-colored varieties. All are good.

The Italian will fly further for honey than any other bee, and, owing to its greater tongue-reach, can gather honey from many deep-tubed flowers which the common black bee cannot work at all. The tongue of the average Italian will measure from 20/100 to 21/100 of an inch, while that of our common black bee will not exceed 16/100 of an inch. Hence, when crimson clover is grown the Italians will, as a rule, store a nice crop of surplus honey, while the blacks will procure hardly enough to keep themselves alive. I have proven this to my own satisfaction time and again.

There is another point in favor of the Italians that speaks highly for them: They will not, under ordinary circumstances, tolerate the presence of the moth or webworm that destroys thousands of boxes of bees annually throughout the country where the blacks are kept.

An old box hive, as you perhaps know, sometimes throws out three or four swarms of bees in the spring. In a case of this kind there are usually not enough bees left to cover the combs. And here is where the moth gets in her work. It is the nature of the black bee to protect no more comb than they actually cover, and in a case of this kind three-fourths of the comb remains unprotected. Hence, the moth crawls in and deposits eggs in the cells of all unprotected combs, and in due time each egg produces a worm that spins webs from comb to comb, and in a short time completely destroys that which remains of the colony of bees and every particle of comb.

In the case of the Italians it is quite different. They rarely swarm themselves weak, and when this does occur I have proved that, though only a handful may be left, they will industriously traverse the combs and keep them clean and free from the eggs that the moth may slip in and deposit.

Perhaps it is not generally known that a colony of bees consists of four classes: Two classes of workers, queen and drones. The two classes of workers are *field* bees, those that gather pollen and honey, and *nurse* bees or comb-builders, those that attend to the duties inside the box. The duty of the field force is to bring the honey in and deposit it in the cells, while the nurse bees seal it up at the proper time, and also deposit food in the cells containing eggs or "grubs" (which are young bees just started), to be consumed by the "grub" after the cell is sealed up, which is promptly done on the ninth day from the time the egg is deposited by the queen. In twelve days more young, thoroughly developed bees will gnaw their way from the cells and crawl around on the comb two or three days before going forth on the wing to gather honey from the field.

A full colony contains usually from 30,000 to 60,000 bees, and, with the exception of a few hundred drones, *all* are females. It is strictly a "female institution," governed, and perfectly, too, by a queen. The drone, while he performs certain duties prescribed for him, has no "say so" as to the government of the colony at all. He is created for certain purposes, and after these are performed he is cast forth from the box, crippled and maimed, to starve.

One of the most wonderful things about bees is this: By special feeding and treatment they can produce from any egg in the box either a worker, queen or drone. This is wonderful and something no expert has yet been able to explain.

Another wonderful thing, too, is this: It has been proven beyond contradiction that a good healthy queen can lay during the heavy breeding season, which is late spring, from 2,000 to 3,000 eggs a day. Now, to one not familiar

with bee-keeping this may seem unreasonable, but there is nothing strange about it. I have taken a comb from a box on which was a laying queen and proven to my own satisfaction that such is true. Of course, her body does not contain all these eggs at one time. After exhausting her supply she resorts to a cell or cut containing a white, "pasty"-like food. She will partake of this food and you can see with your naked eye her body gradually grow larger. After a bit she moves away and it will not be long before you will see her begin depositing eggs as before. Of course, it is absolutely necessary that she lay heavily, as she has a family of 30,000 or 60,000 to keep up, as the life of the field bee, or worker, is only about twenty-one days to a month. During the honey season they are dying by the hundred every day and hatching out at the same rate. Thus the "wheel" turns round.

To exhaust this subject would take an indefinite period. Like Tennyson's "Brook," it has no end.

Bee-keeping could be made a paying industry in this State, and if intelligently managed would be a source of considerable revenue; but as the men, who constitute the reigning factors in our State government, cannot see the matter in the light in which I have tried again and again to put it, I now appeal to the "woman on the farm," the farmers' wives and their daughters. It is up to you, ladies, to start the "ball a-rolling." I hope to live to see the day when the farmers' wives have made such progress along this line that their "masters" (?) will open their pocketbooks and cheerfully lend their assistance.

I guess you all have heard the story of the old woman and old man that were attacked by a bear. The man, without offering any protection whatever to his wife, climbed a tree and left her to fight the bear alone, which she did, and very soon laid him low with an axe. When the bear breathed his last breath, the old man came down from the tree and, seizing the axe, exclaimed: "Stand aside, Martha, and let me show you how to kill that 'b'ar.' "

So it will be, perhaps, with the farmer's wife and her bees. When she begins to make annually from $50 to $100 from a half-dozen to a dozen boxes of bees, giving them but a small portion of her time during the swarming season, his eyes will then be opened, perhaps, and he, no doubt, will then come forward and offer to show her "*how to keep bees.*"

California produces, on an average, from 3,000,000 to 5,000,000 pounds of honey annually and ships to the eastern markets from 200 to 300 car loads each year, and enjoys not only a national but an international reputation as a honey-producing State; while North Carolina, on the other hand, which has twice the number of bees of California, according to government statistics, enjoys no reputation at all as a honey-producing State, though she has a finer field for bees than California. What's the trouble? Answer: Crude methods in North Carolina and scientific bee-keeping in California.

As I have traveled extensively through North Carolina, California, Texas, Florida and other honey-producing States, I can honestly say I have never yet found a section that surpasses western and eastern North Carolina as bee-producing sections.

What we need to place North Carolina in the front ranks is energy, intelligence and up-to-date methods. There is plenty of money in bees and honey, but you will not get it by keeping your bees in old box-hives, hollow logs, nail kegs, etc. Modern boxes, modern bees and modern methods are the requisites to successful bee-keeping.

THE COUNTRY WOMAN'S SPENDING MONEY.

By Mrs. James G. Boylin, Wadesboro.

A prominent educator of North Carolina, now a president of one of the most thriving banks of our State, said to me when a girl of fifteen summers: "Be something, know something, and do something"; to these three admonitions I will add, "have something."

In the home sometimes the question of the rule of the fittest arises, who shall carry the purse, the husband or the wife? From my standpoint, the solution is this: let each have his or her money.

If an opportunity is given a cheerful working woman to make her spending money, she usually profits by it.

Women, as a class, must have something to do to be content. A woman is never happier than when she is independent.

Contentment is a beautiful trait of character to cultivate, and a woman is happier in proportion as she is content. Every one has an individual talent for something, and every ambitious woman has a special object in life she hopes to accomplish. By her efforts of hand and brain she leaves an impress upon the world in the work she does, and pays a debt to her Creator.

Every woman should start a savings-bank account for this reason: when she comes from the market, after having bought a few necessaries, there is only a little left, and this thought comes to her mind: These few pennies amount to so little that I will never accumulate anything. But as the little sums jingle in the small iron bank, her ambition for more pennies and dimes is aroused and thereby a system of saving is established.

Little by little, as our savings increase, our opportunity for doing greater things is enhanced. The time for the wife to begin saving is in the early stages of married life; as the family increases, the expenses of feeding, clothing and the sending to school of the children must be met. Then all the extra earnings of the mother are used for these things, and, to all appearances, her work amounts to but little. The children should be encouraged to work by paying them. Boys and girls will help make the mother's spending-money account grow by having a commission given them on the produce taken to market.

An individual bank book is a stimulus to every man, woman and child.

Children have favorite schemes which they hope to accomplish. Oftentimes with boys it is the pony and little red saddle, and with the girls the doll with golden curls. While the sons are out on the farms making wages, raising colts, which will mature into a span of well-matched horses, the daughter just developing into womanhood ought to have the privilege of making money. So, many times the farm life grows monotonous to the young lady. A yearning desire seizes her to go into the town to earn her livelihood.

Girls on the farm who make an effort can have as much spending money for their individual pleasures as the girl who goes to town to work at the stenographer's table or behind a ribbon counter.

In the case of the educated daughter there are the younger children to teach. What nobler calling can the young girl graduate follow than teaching the children of her neighborhood, be they kindred or tenants? The country children need the advantage of higher education to keep abreast of the times. At the present market value of produce there is no reason why every neighborhood cannot have a teacher supported by the earnings of the women of the community. An honest man or woman of sound body and trained mind can become fitted to enter any position in life.

The country woman is coming more and more into prominence. The State Department of Agriculture is issuing helpful bulletins for her benefit, at the cost of the asking, on subjects like these: Butter-making, bread-making, the wholesome foods, etc.

The cooking of nutritious foods for our tired husbands, sons and helpful daughters is an accomplishment equal in value to the knowledge of the fine arts. Nourishing diet fed to our boys and girls helps to mould character for greater things.

The making of beautiful preserves, jellies, palatable jam, and pungent pickles, and the canning of vegetables, help to add to the spending-money account. Possibly our town and city friends would buy from us rather than the foreign canners.

The kitchen apron made of "white homespun" is a badge of honor to the poorest country woman, to the woman of the city, who rules in the highest educational meetings or leads in the most fashionable circles.

The person who dislikes the sign of toil is weak morally and intellectually. The humblest calling affords room for expansion.

Every woman should try to excel in something. Be authority on some subject; try to reach the topmost round of the ladder. Every woman has a favorite recipe, and when husband or children, possibly guest, compliment the dish, a tender chord is touched.

In this day of improved roads and netted telephone systems, we can add weekly to our bank accounts. It is just as necessary to know how to sell our produce as it is to make it. The most essential feature is special customers, the next the manner in which we deliver our products. Attractive, clean, neat and fresh packages necessarily bring a better price than carelessly handled packages.

We must cater to the tastes of our customers, not put too much salt in the butter, nor too much pepper in the sausage, and the many little peculiar tastes we learn by dealing with people for years.

When we think of the fruits of the orchard, the vegetables of the garden, with the pure milk and butter from the dairy, the fresh eggs, tender broilers, juicy roasters from the poultry yard, we cannot be cut off from anything we wish to have.

So many of the people of my county do not own their homes. As the country woman sees her bank account grow, her husband must necessarily be accumulating, too; then the desire for a few acres of land is so strong that soon a real home of their own is bought, then the insatiable desire to own the adjoining acre is too strong to resist; a good investment for a woman is a good horse and comfortable buggy. To the woman who owns her acres and lives in her colonial residence, the bank account is just as necessary as to the woman of the few acres and the three-roomed house.

A herd of fawn-colored Jerseys grazing on the pasture makes the plantation more attractive, the sheep adding delicious lamb to the spring menu, the goats for the little ones to drive, all increase the spending money of the planter's wife. The prize-winning chickens, the quacking ducks, the noisy guineas, warning the hostess of the approaching guest; the downy geese, which are the faithful guardians of the night; the fattening turkeys gobbling for Thanksgiving, the vari-colored peafowls, screaming in the highest trees, all lend an aristocratic air to the model home, and by the prizes won, the feathers obtained and the pounds of delicious meats produced, may all be made to add to our individual bank account.

My personal experience with spending money comes from the care of two good cows. I think I can safely say a woman who is near enough to town to sell her milk and butter can realize one hundred dollars clear profit a year from each cow.

What occupation is more health-giving than to go out with your boys early in the morning and speak a few cheerful words with them as they bring the milk that will be turned into dollars?

There is so much satisfaction in being called over the 'phone and asked for butter by your customer, whom you have held for years.

THE MOTHER AS A SOURCE OF INSPIRATION TO THE CHILD.

By Mrs. Frank Elam, Cleveland County.

Of course, all mothers wish that their children may reach high ideals in every way. This model or pattern varies according to the different people. In ancient times it was strength, size and symmetry of form more than mental ability—at least, that was man's view of perfection. As an example, let us refer to the choice man would have made when David, the boy king, was chosen. Our ideals should be carefully studied, and we should ask ourselves this question: Is this the mould God would have us choose?

Let us aspire to something noble and great; then, if we are so unfortunate as to have our little ones stop before reaching the topmost round of the ladder of fame, their position will not be one of which we are ashamed.

How early do these aspirations take effect on our children? Can we tell? At first they are creatures of imitation. What mother has not watched the little tots at their play do just as they have seen father and mother do? When several children are at play where they think they are unseen and unheard, so often we see our own actions reproduced, hear our own words used, even the tones imitated. Sometimes these reproduced scenes that come before our vision bring sorrow and remorse. What hint is this to us? Our every action is an inspiration in some way. Is it as we would like to have it—a noble, uplifting one? So, much can be given by way of example. If we are cheerful and look at the bright and best side of life, so will the child. If we complain and call life's pleasant paths a hard way, and appear as if we were the most abused of all God's creatures, talk as if all were foes instead of friends, and never had what we term a streak of good luck, just so the child will be.

How can we teach the children to be unselfish, pleasant, cheerful companions, to be a help and give to others that happy, uplifting inspiration, if we are not so ourselves? At times we should stop and think, What impressions have my actions made to-day? After the day's summing-up, perhaps on the morrow we may make better and more lasting ones—something God would have us print deeply on the character of the little lives He has given to our care to mould into noble manhood and womanhood, and for whom we would sacrifice our lives.

Further on, the little ones take more notice of life, of their surroundings and all that may appear before their vision. They ask us so many questions concerning what they have seen; they begin to think and reason for themselves. So, often when we find a little one deeply interested in something he has seen, we can lead him to think so much further than if left alone.

At this period we can begin education proper. Let us think what education is and what it means to our children. What will it do for them? What has it done for nations in the past? It has lifted human beings from a level with the lowest of God's creation to the highest place of Heaven. If by tact belonging to the mother alone we can create a desire for this education, an unceasing desire for learning more and more about what is seen and heard every day, much has been accomplished. Soon they will be obtaining knowledge for themselves.

Without the proper aid, teachers and text-books cannot accomplish much. Mothers must aid them. Ask the children about what they are doing every day. Tell them how you did when you studied these same lessons, and compare the difference. Often this alone will arouse deeper interest, and interest in the work is all that is necessary. When a child has become interested and filled with enthusiasm, what a joy it is to him to tell father and mother all the new things he has learned each day! By the interest we take in this their first great achievement we add to or diminish their desire for study. So, often our little ones' interest is just what the parents' may be, and we must ever be mindful of this fact.

Now that we have inspired this thirst for knowledge, we have a greater problem before us. There is a way in which we may satisfy this thirst that may cause a bright, beautiful life to prove an utter failure. I have seen two brothers, both equally brilliant and promising, with equal opportunities, one make a man of whom our whole nation may well be proud; the other become an outcast and a curse to his country. This one failed to receive the inspiration creating the high ideal of manhood and the desire to learn something to lead to true greatness. That is only reached by being truly good and useful.

So, often the making or marring of lives is due to the taste for reading and study. The child who enjoys history, biography, nature study and later on science is not so likely to ever stray off into the haunts of vileness, always at hand, as the one who quenches his thirst for knowledge or whiles away the golden moments by reading sensational stories and dime novels, the vilest of all vile literature. Do we mothers see this as we should?

Of all the moulders of character, mothers are so much more responsible and should, more than all others, rely on Divine guidance, that they may not err in directing the lives of their children.

In a list of literature that we may safely give our little ones are the following: First Stories from the Bible (nothing is so interesting to a child as well-told stories from this wonderful Book), Andersen's Fairy Tales, Æsop's Fables, The Swiss Family Robinson, Robinson Crusoe, Kingsley's Greek Heroes, some of Shakespeare's works, and mythology. There are other authors not to be overlooked. There are no books more wholesome or enjoyable than those of Louisa M. Alcott and Joel Chandler Harris. Of the periodicals, *St. Nicholas* and *The Youth's Companion* are excellent.

If we provide children with this most helpful of all pastimes, they are happy and content in their own homes. Often if their minds are unemployed they will find entertainment elsewhere. Country mothers and children are blest beyond all others; they have nature for a teacher—and where is the child one cannot interest with all the sights and sounds seen and heard on a bright, sunny day? The early song of the birds at dawn, the glorious sunrise, to watch the sparkling dew—teach them to watch every one of God's creations from morning till night. So much can be gained. The more one can see, the more there is to enjoy through life.

We must teach them to have thoughts for the future. What will they do, and whom will they be like? Will they want to do something great, to be a force and factor in their day, to make the world richer while they live and poorer when they die?

We must try to make them understand that these golden days of life's morning are the days of preparation for all life's battles. As the moments fly they must get ready for living a life that is pure and noble, or else live in vain. Let us teach them that they can train the mind as well as the sinews while they plow the fields, or feed the horses, or sweep and dust—that

> There is a work for me and for you,
> Something for each of us to do.
> And it befits us to do noble things—
> Not dream them all day long.
> We are not here to play, to dream and drift;
> We have hard work to do, and loads to lift.
> Shun not the struggle; face it; 'tis God's gift.

Carlyle said: "Men do less than they ought unless they do all they can."

There is another thought we must not pass—that of individuality. We want our children to be *themselves*. We must have ideals, but still retain that individuality. We all have seen people who tried to be just like some one they had seen, and often they failed to do anything at all, though their ideal was a charming personality. Teach them that they must think and act for themselves—that thinking well is wise, planning well is wiser, doing well is best of all.

There is another noble trait of character we must at all times try to impress deeply while we are moulding—that of doing something for the happiness of others. Selfishness is a most unlovable trait, and there is always unhappiness.

If I can live
To make some pale face brighter, and to give
  A second luster to some tear-dimmed eye,
Or even impart
One throb of comfort to an aching heart,
  Or cheer some wayworn soul in passing by;
If I can lend
A strong hand to the fallen, or defend
  The right against a single envious strain,
My life, though bare,
Perhaps, of much that seemeth dear and fair
  To us of earth, will not have been in vain.
The purest joy
Most near to Heaven, far from earth's alloy,
  Is bidding cloud give way to sun and shine.
And 'twill be well
If on that day of days the angels tell
  Of me, "She did her best for one of Thine."

WORK WHICH THE WOMEN'S INSTITUTES MAY DO.

By Miss Eula Dixon, Alamance County.

The day of castle and moat and drawbridge is over. The moat is filled up and the castle torn down. Humanity is beginning to realize that "no man liveth to himself"; that "we are members one of another." Being "members one of another" implies service one for another—sometimes mutual, sometimes missionary. In either case we have learned just one way of working together—organization—and this is the order of the day, because it is the key to the quickest and best results.

An organization has only one excuse for existing, and that is the need of it. The fact that it is able to reach any individual or class which cannot be reached by any other agency proves the need. When the work of an organization is done, it dies as we die when our work is done.

The Farmers' Institute was introduced into our State only a few years ago. Its counterpart, the Woman's Institute, is practically new to us. Thousands of our women, probably, have never heard of it. To thousands of others, perhaps, it is scarcely more than a name—their knowledge of it so slight as to preclude any possibility of practical benefit therefrom without further acquaintance. To others, no doubt, it appears but another of numerous organizations which in some cases are proving a "weariness to the flesh." A few persons have been introduced to this institute work and are beginning to realize its value.

I am here to-day to present, as best I can, its claims for existence, as I see them.

The Woman's Institute is, as far as I know, the only organization on earth for the benefit of the women of the country particularly—a class that includes more individuals who need *more* help and get *less* than any other class in the world. In defining the Woman's Institute we might first specify what it is not—an organization intended to advance any particular interest—physical, mental, moral or material—yet embracing all. If I were asked to give its aim in a single phrase, I think I would say, "a more abundant life." Because of the neglected class for which it exists, and the number and variety of interests it may foster and vitally affect, this definition cannot be far wrong.

Some people are very enthusiastic over country life, and picture it as almost ideal. Nature *is* beautiful—the changes which the seasons bring, with their ever-varying tints and shadows, the life that teems on every hand. The country is *all right*, but the joys of farm life that you read about do not always materialize. A drive in the pure air of a spring morning, as the birds begin to wake, is no doubt delightful, but do you suppose that one farmer's wife in a thousand ever experienced that delight? What can be grander than some of our gorgeous sunsets? Yet they pass unobserved by thousands of tired women in the midst of milking, baking hot biscuits and putting the children to bed. Up before day, busy from sun to sun, the last one to rest at night, sooner or later the constant grind has its effect. Eye and ear become dulled and the heart unresponsive to the beautiful things our Heavenly Father has provided, and hosts of women right here in North Carolina might as well be in midocean, as far as their enjoyment of country life is concerned.

A woman remarked to me once: "Seems like I haven't the time to *train* my children. It is all I can do to keep them something to eat and wear." And she was not the breadwinner, either—only cook, housekeeper, seamstress, etc. This is but the wail of many hearts. My precious mother kept house over fifty years, and, as far as I know, never had a vacation. There was always something for her to do. She, like many others, didn't know how to rest. Much hard work falls to the lot of women in the country, and, at best, it must always be so; but I do believe it could be lessened to an extent.

By the introduction of as many conveniences as the head of the house would install, and just as much machinery as he would bring in if he had his wife's work to do; by the addition of labor-saving utensils; by the disposal of useless accessories in the home; by the united plan and effort of both husband and wife to make the work on the farm fit the force indoors—these things would do more than anything else, I believe, toward lifting the burden from the back of the patient housewife—things to save strength and save time. How she needs to conserve her strength we can easily guess, but how she craves more time for herself no one but herself realizes. How she longs for it—time to take care of her health, time to cultivate the virtues of character, time to open up imprisoned mental activities, time to give her children proper training, time to enjoy the friendships of life and the beauties of nature, time to practice the deeds of Christian charity, time to rest and be happy and to grow old gracefully.

We need the Woman's Institute for scattering information concerning conveniences in the farm home and for the interchange of ideas and experiences which will facilitate the work. Intelligent effort along this line would undoubtedly result in great benefit to the women directly, and indirectly to all. I am glad that this idea has been embraced already and carried out to an extent by the institute workers this year. But we need *more, much* more, *very* much more of it.

Imagine, if you can, a young girl, all pink and white, and dainty and æsthetic, looking forward with delight to a life of routine work, such as falls to the lot of the average farmer's wife. Such a monstrosity has never lived, I'm sure. Our girl cannot possibly understand how mother can devote herself entirely to pots and pans and broom and mop and washtub, and never want any pretty clothes nor to have any fun. The daughter thinks, honestly, she never could be like that. But a few years bring about great changes, and ere long she finds herself in her mother's place, doing the very same kind of work, with equal interest and devotion.

By making the farm home less of a grind, and introducing into the country, as far as practicable, the attractions of city life which charm and are really "worth while," opportunity for the study of music and art, etc., and substituting ways and means for making pin money, at least as much clear money as salesgirl or seamstress or any other position which the average country girl must accept can command, many girls might be saved to the country, much to its benefit and their own. I believe that this thing of making a little money to have and to spend as her very own takes many a girl away from home who would not otherwise go. Here is a wide-open door for the Woman's Institute.

The isolation of the country home, the lack of recreation and social enjoyment militates, also, against country life in the minds of the young, both boys and girls.

In how many farm homes do you suppose the recreation of the children is a matter of much concern? How many fathers did you ever hear encouraging their boys to go to a ball game? Did you ever hear a mother say, "There is plenty of work to do, if she wants exercise"? Did you ever hear a parent say that the children were not sent to school to play?

The question in the rural mind should be changed from "How can I get away?" to "How can I make conditions such that I shall want to stay or be contented if I have to stay?"

North Carolina has for some time had the unenviable distinction of standing low down in illiteracy. A decided effort has been made by the authorities to raise the standard, and with gratifying results, but the desired end is not yet attained. The trouble is that too few are working, compared with the amount of work to be done. There is not that support from the people as a whole that would appreciably hasten the work. And why? Right here is an open door for the Woman's Institute. One of the first things to emphasize is the necessity of regular attendance, and with this the mother has most to do. The brightest child can make but poor progress if kept out or allowed to remain out of school a day or two in every week. The best teacher and course of study fails under such conditions. State and county may furnish the best equipment at command, but it is with the mothers to see that the children take advantage of the opportunities offered. They can at least see to it that the children are at the place appointed, even if they cannot compel them to study diligently. We are bound to admit that chances are in favor of the boy or girl who is *there*. Mothers can see to it that for no trivial thing the children are kept at home. But before mothers will make it a point to keep their children in school regularly they must be made to realize the necessity of such attendance.

Our public-school system is undergoing a change—better teachers, better salaries, better houses, better everything. Graded schools are being established in every county, built up on the basis of local taxation. People are beginning to think of having a plan of work and working the plan, and even improving the plan as the years go by. Education is no longer confined to the mastery of the three R's, as in the past, important as these are. Gradually it is taking on a broader meaning. Slowly the idea is growing that the dead past is not more important than the living present. A prominent educator of Wake County defines education as "putting the mind in sympathy with conditions around." You may give this your own interpretation.

There is certainly a growing demand for what the scientist terms "coming into the knowledge of your surroundings," of getting acquainted with the things about us—the birds, animals, fishes, flowers, trees, insects, rocks—for instruction in agriculture, manual training and domestic science. Now, I believe that the country school needs all of these. We have too long been educating our children not for but away from their surroundings, practically driving them away to the towns and cities. In a recent issue of *The Progressive Farmer* is this quotation from Dr. G. Stanley Hall: "The germ and extract of as many trades as possible must be introduced into the common schools."

Put your ear to the ground and listen. These things are coming. Manual training may be left largely to the city schools, but agricultural training will naturally come to the country, while domestic science belongs to both city and country. We can hardly think of a subject more important to our girls than domestic science. Everybody eats. There is no way to get out of it except to die. In the distribution of the world's work it is women's to prepare the food, and it is but reasonable to say that they should know their business, rich and poor—the rich, that they may have their cooking done properly; the poor, that they may do it properly. We want a dignity given to the kitchen work that it does not have at present. We want to hasten the time when milady's biscuits will no longer add to domestic discord, and what we eat will be what we need. We want to get rid, as soon as we can, of the idea, now largely prevalent, that if a man cannot do anything else he can farm, and if a woman cannot do anything else she can cook—the two professions which, of all others, it seems to me, require the broadest training to practice successfully. In all this the Woman's Institute may prove a valuable aid.

A host of women over the State is at work for the schools, improving the surroundings, doing what they can to better the equipment. They are doing a great work. I, for one, deeply appreciate their motive and the spirit of help-

fulness which they are cultivating everywhere. But in some cases, perhaps in many, I fear they are but doing the work that their brothers are appointed to do but are neglecting. If this be true, it is a condition of things which should not continue indefinitely. It is not just to the women. It seems to me that there is a position that they might occupy from which they could accomplish as much and more, with less expense of time and energy. Sometimes people can do more by getting into position to do more.

I can see no advantage in always occupying the position of a suppliant and begging permission to do the drudgery. Some drudgery is a necessity, and it is all right for one to do it until somebody "higher up" decides that that is all one is fit for. If it is all right for women to collect money to build schoolhouses, it is just as right for them to have a voice in the plan of building and in directing the work of the school. Why not? And nothing keeps you, my sisters, from these more honored positions except the laws, man-made, of your State. There is quite a good deal of sentiment scattered throughout our State, already, in favor of women serving on school boards, advancing them to a position of commanding influence. Some time this sentiment will crystallize into law. It may be within the province of the Woman's Institute to gather this sentiment together. Anyway, it might help to do it. The task will not be easy; it will not be without reproach from some quarters; but precious privileges come dear.

I do not mention this subject without deep conviction. We tried the experiment up in Alamance a few years ago. We have a county superintendent who says that a woman can give a touch to the work that no man can give. In line with this thought, in the establishment of two local-tax districts by legislative enactment, six years ago, he named a woman on each board. It raised a storm of disapproval among the men at home. The attention of the Attorney-General even was called to the matter, as to whether or not these women could legally serve. His decision was that they were eligible because appointed by the Legislature, but that no woman could be elected by popular vote to any position in North Carolina. That's our status before the law.

There is hardly a school district in North Carolina in which there is not some woman who would gladly give her time and talent to this work. The State Normal has a representative in almost every neighborhood, and other colleges send out annually their contributions of capable, earnest women. A large per cent of our public-school teachers are women, and the per cent is not likely to be materially lessened, for the State is educating her daughters to be teachers, and not her sons. If training for a special purpose and experience along that line do not qualify, what does? Is it to be supposed that men, minus this training and experience, are still better qualified for teachers and school committeemen than women, plus this training and experience? I do not believe in divine favor to that extent, and, unless there is some method of absorption of which I am ignorant, I see odds against the men. There is absolutely no argument against women serving on school boards—only prejudice. When this is gone women will come into possession of their own.

"Two heads in council, two beside the hearth,
Two in the tangled business of the world."

I am not more ambitious for women than I am anxious for our schools to be under the care of those best fitted to direct the work. Nobody wants women to supplant men in this work. It is not man nor woman, but capability that will best serve the interests of our public-school system. Whether the present legal impediment debarring women from positions on school boards is either wise or expedient, the manhood of the State will, in the course of events, be called upon to decide.

The greatest difficulty with us in all of our work, perhaps, is that our efforts, in the main, are too spasmodic. Nothing counts in this old world like a strong, steady stroke. I admit that ignorance is a close second. We often fail to do because we do not know what to strike with nor where to strike. This, I feel, is not far from the condition of the women of the rural districts generally as regards this institute work. It appears to us such an indefinite something of which we do not know how to take hold.

If this work appeals to this meeting as worth doing, I believe that we should not go to our homes until some definite plan is suggested and approved for the benefit of the scattered workers over our State, who would do something if they knew how to begin.

Section 4140 of the public-school law reads as follows: "The county superintendent shall each year hold not less than one teachers' meeting in each township, which the teachers shall be required to attend. If necessary, one school day must be set apart for this purpose." I do not know whether this provision is generally carried out or not, but it certainly was intended to be, and *ought* to be.

Now, in connection with the above, this is my suggestion: That the Woman's Institute, wherever there is an organization or an interested woman, ask the county superintendent for a share in the time of the teachers' meeting in its or her respective township, and aid in arranging for the meeting. With a live program and a good social time together, the day might be made one of mutual helpfulness and an encouragement and recreation all around. In course of time the occasion might become one of broader significance. These meetings would not be hard to arrange, and, I feel sure, would be well worth the trouble.

Anyway, we must get the unit nearer home. We must, somehow, get the women of the country, for whom the organization exists primarily, in touch with the work, or it will fail in its purpose. This cannot be done in a day, but it can be done in time, and it must be done. All reforms come slowly, but they come at last.

DAIRYING.

Under the stimulating and helpful influences of the National and State Departments of Agriculture, the State Dairymen's Association, the Dairy Department of the A. and M. College and the individual efforts of dairymen and other agricultural workers, the dairy interest in the State has been much increased.

MOVABLE DAIRY SCHOOL.

The first movable short course in dairying held in this State was conducted by representatives of the United States and State Departments of Agriculture at the farm of Jonathan Case, Dana, Henderson County, October 26 to 30.

The following program was carried out:

Monday, October 26.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Corn Harvesting; Silo Filling.
3:00 to 4:00 P. M.—Feeds.

Tuesday, October 27.

9:00 to 12:00 A. M.—Cleaning Cattle; Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Diseases of Dairy Cattle.
3:00 to 4:00 P. M.—Herd Records.
8:00 to 9:30 P. M.—Clean Milk and Silo Building (illustrated with lantern views).

Wednesday, October 28.

9:00 to 12:00 A. M.—Judging Cattle; Separating Cream; Milk Testing.
2:00 to 3:00 P. M.—Home-grown Feeds.
3:00 to 4:00 P. M.—Dairy Buildings.

Thursday, October 29.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing.
2:00 to 3:00 P. M.—Pastures.
3:00 to 4:00 P. M.—Feeding.

Friday, October 30.

9:00 to 12:00 A. M.—Separating Cream; Butter Making; Milk Testing; Butter Judging.
2:00 to 3:00 P. M.—Flies in Relation to Clean Milk and Health on the Farm.
3:00 to 4:00 P. M.—Herd Records (figuring out records of herds in the neighborhood).

There were about thirty regular attendants at this school, who took a deep interest in the work. This short course in dairying was conducted by:

Mr. J. A. Conover, the expert dairyman, who has for the last two years been in charge of the dairy demonstration work conducted in North Carolina by the United States Department of Agriculture and the State Department of Agriculture.

Mr. B. H. Rawl, Dairy Expert, United States Department of Agriculture, Washington, D. C.

Dr. Tait Butler, Veterinarian and Director of Farmers' Institutes, North Carolina Department of Agriculture.

Mr. L. M. McCormick, Chief of the Sanitary Department, Asheville, N. C.

It is the purpose of those having in charge the dairy demonstration work in this State to hold several of these dairy schools in different parts of the State where satisfactory facilities can be secured and the interest is sufficient to justify the effort.

There is a good demand in this State for first-class butter at remunerative prices, and yet more than half the butter made in the State is sold for less than half the price which the first-class product commands on our markets. At these short-course dairy schools special attention is given to butter making, which affords all interested an opportunity to learn how to make better butter by *actually doing it* under the direction of an expert butter maker.

STATE DAIRYMEN'S ASSOCIATION.

The dairymen of the State met during the Farmers' Convention and carried out the subjoined program:

PROGRAM DAIRYMEN'S ASSOCIATION.

Thursday, August 27.

7:30 P. M.—Business Meeting and Address by President R. H. Gower.

Friday, August 28.

8:00 A. M.—Judging Dairy Cattle.
9:00 A. M.—Cottage Cheese Making; Butter Making; Skimmed Milk; Buttermilk Manufacturing.
10:00 A. M.—How to Make Farm Butter Making Profitable—R. L. Shuford, Catawba County.
11:00 A. M.—Marketing of Milk and Cream—Prof. William R. Saunders, Virginia.
12:00 M.—Silos and Silage, by B. H. Rawl, Dairy Division, U. S. Department of Agriculture.
2:00 P. M.—Keeping Herd Records—J. W. Robinson, Catawba County.
3:00 P. M.—Relation of Dairying to Soil Fertility—Prof. C. L. Newman, North Carolina A. and M. College.
4:00 P. M.—Management of Dairy Herd—Prof. John Michels, North Carolina A. and M. College.

The following papers, chiefly relating to dairying, were read at the Dairymen's Meeting or at the Farmers' Convention proper:

CO-OPERATIVE DAIRY DEMONSTRATION WORK IN NORTH CAROLINA.

By J. A. Conover, United States and State Departments of Agriculture.

July 1, 1906, the United States Department of Agriculture, in co-operation with the State Department of Agriculture, began dairy demonstration work in this State. This work is not for the purpose of gathering statistics, as many suppose, but to promote the dairy industry in this State. Assistance has been given along two principal lines of work, viz.: the building of barns and silos and the improvement of herds by a systematic weighing and testing of the milk from each cow.

It has been shown that the only way of knowing how much profit a cow will make is to weigh the milk each day, test once or twice a month and keep account of the feed eaten. There are many cows in this State that do not pay for the feed they eat, and yet their owners complain because the dairy business is not profitable.

January 1, 1907, the work of keeping records was begun with thirteen farmers; more were added during the year, and for various reasons some were dropped; only nine herds finished the year's work, with a total of 103 cows. Of the nine herds completing a year's record only one was composed entirely of pure breds, the remaining herds being made up mostly of scrubs and grades with a few pure breds.

In Table No. 1 is shown the ten best cows of the 103 head, but as these cows were all pure bred and all owned by the same man, it seems hardly fair to the other 73 cows, which were mostly grades, to compare them with this pure-bred herd, therefore this herd of 30 pure-bred cows is set aside and the ten best cows from the remaining herds selected and their records shown in Table No. 2.

TABLE I.

Record of 10 Best Cows (Pure Bred).

No. of Cow.	Pounds of Milk.	Pounds of Butter Fat.	Value of Butter Fat.	Value Skimmed Milk.	Total Value.	Cost of Feed.	Profit per Cow.
1	8,325.5	538.79	$188.58	$15.57	$204.15	$72.03	$132.12
2	9,531.5	522.53	182.89	18.02	200.91	68.60	132.31
3	7,990.5	488.48	170.97	15.00	185.97	74.52	111.45
4	8,447.8	484.89	169.71	15.93	185.64	68.72	116.92
5	7,001.3	419.58	146.85	13.16	160.01	66.75	93.26
6	6,598.7	385.32	134.86	12.43	147.29	63.24	84.05
7	6,098.0	378.16	132.36	11.44	143.80	63.34	80.46
8	6,159.5	372.39	130.33	11.57	141.90	62.02	79.88
9	6,389.5	361.88	126.66	12.05	138.71	56.53	82.18
10	4,908.5	343.50	120.23	9.13	129.36	53.08	76.28
Total	71,450.8	4,295.52	1,503.44	134.30	1,637.74	648.83	988.91
Av'age	7,145.1	429.55	150.34	13.43	163.77	64.88	98.89

TABLE II.

SECOND 10 BEST COWS (OMITTING HERD OF 30 PURE BREDS).

No. of Cow.	Pounds of Milk.	Pounds of Butter Fat.	Value of Butter Fat.	Value Skimmed Milk.	Total Value.	Cost of Feed.	Profit per Cow.
1	5,469.0	307.96	$107.79	$10.32	$118.11	$53.79	$64.32
2	6,151.0	307.43	107.60	11.69	119.29	56.51	62.78
3	5,749.5	305.99	107.10	10.89	117.99	64.35	53.64
4	5,505.0	294.43	103.05	10.42	113.47	51.44	62.03
5	4,864.4	287.33	100.56	9.15	109.71	50.29	59.42
6	4,916.2	282.22	98.70	9.27	107.97	58.79	49.18
7	4,918.7	277.73	97.20	9.28	106.48	54.34	52.14
8	4,354.5	275.34	96.37	8.16	104.53	45.30	59.23
9	5,011.7	274.40	96.04	9.47	105.51	52.41	53.10
10	5,135.1	267.46	93.61	9.74	103.35	36.87	66.48
Total	52,075.1	2,880.29	1,008.02	98.39	1,106.41	524.09	582.32
Av'age	5,207.5	288.03	100.80	9.84	110.64	52.41	58.23

In Table III is shown the record of the 10 poorest cows in the 103 head. It is worthy of note that none of the cows in the herd of pure breds, 30 in number, appear in this table.

TABLE III.

SHOWING THE 10 POOREST COWS.

No. of Cow.	Pounds of Milk.	Pounds of Butter Fat.	Value of Butter Fat.	Value Skimmed Milk.	Total Value.	Cost of Feed.	Profit per Cow.
1	2,247.0	108.86	$38.10	$4.28	$42.38	$28.42	$13.96
2	1,848.4	116.46	40.76	3.46	44.22	28.94	15.28
3	3,043.0	118.17	41.36	5.85	47.21	40.86	6.35
4	2,357.8	127.36	44.58	4.46	49.04	30.97	18.07
5	3,081.0	127.82	44.74	5.91	50.65	41.42	9.23
6	3,403.0	129.14	45.20	6.55	51.75	38.36	13.39
7	2,403.0	134.77	46.47	4.54	51.01	38.12	12.89
8	2,680.9	135.21	47.33	5.09	52.42	49.89	2.53
9	2,870.0	135.31	47.36	5.47	52.83	39.39	13.44
10	2,775.0	136.74	47.86	5.28	53.14	34.06	19.08
Total	26,709.1	1,269.84	443.76	50.89	494.65	370.43	124.22
Av'age	2,670.9	126.98	44.38	5.09	49.47	37.04	12.42

It will be seen by comparing the tables that the average net income from Lot I was $98.88; Lot II, $58.23, and from Lot III, $12.42. Many of the cows in Lot III would have run their owners in debt for the feed eaten had it not been for the high price of butter fat, viz., 35 cents per pound.

The average cost of producing a pound of butter fat: Lot I was 15.1 cents; Lot II, 18.1 cents; Lot III, 29.1 cents. The 103 head produced butter fat at a cost of 20.2 cents per pound; eliminating the 30 head pure bred brings the cost of butter fat to 22.3 cents per pound.

The poorest herd, 15 cows, produced an average net profit of $20.95. The best herd, 30 cows, all pure-bred Jerseys, produced an average profit of $70.01, while the next best 10 cows produced an average profit of $47.66.

These tables show the importance of weighing and testing the milk of each cow in the herd as nothing else can. But I hear some one in the audience say, "Are you not afraid that if we all do this that we will soon overstock the market with butter?" What! Afraid! when North Carolina ranks twenty-fifth as a dairy State, has only five cows per square mile, as against 32 in New York, and imports 1,000,000 pounds of butter annually!

MY EXPERIENCE WITH THE DAIRY DEMONSTRATION WORK OF THE UNITED STATES AND STATE DEPARTMENTS OF AGRICULTURE—KEEPING HERD RECORDS.

By J. W. Robinson, Catawba County.

Two years ago last May I started into the dairy business with a hand separator and ten cows. The cows were such as I could pick up about the country; most of them were bought when they were calves and kept until freshening.

In the fall a representative of the State and Federal Departments of Agriculture, Mr. J. A. Conover, visited my place, assisted me in building a barn and silo, and tried to persuade me to keep a record of my cows; in fact, made a test or two of the herd, but, like many men, I wanted to wait until more cows were fresh or giving milk, so as to make a bigger show at the start, thinking this was the way to begin.

After several visits from Mr. Conover and a lot of talk on his part, I began keeping records February 1, 1907, weighing the milk twice a day and keeping a record of the feed. After weighing the milk for two months and seeing the tests made, I found that one cow ran me in debt ninety cents, while the nine cows giving milk made an average profit of only fifty-four cents above the cost of feed. This set me to thinking, and I decided that someone that didn't believe in records should have all my cows except three. The one I thought best in the herd before keeping records I afterwards decided to give away, if I couldn't sell her.

The money that came from these six cows and their calves was put into six pure-bred Jersey cows, whose owner had been keeping records for a number of years. This trade left me in debt, but I had the satisfaction of knowing just what to expect from my new cows. Since making the change and keeping records for one year, I find that my best cow made a net profit of $53.61, while the poorest made a net profit of $27.21. The best cow produced butter fat at a cost of 16.4 cents per pound. The poorest one produced butter fat at a cost of 21.5 cents per pound. The nine cows finishing the year's record made an average of 257½ pounds of butter fat at an average cost for feed of $46.74. Figuring the butter at twenty-five and thirty cents per pound and skim milk at twenty cents per hundred for feed, the average profit per cow is $39.40. The actual total money received for products sold for nine months of 1906, before keeping record of my herd, was $273.09, an average of $30.35 per month, or $364.08 for twelve months. For the year 1907, after keeping records, I received for products sold $759.95, and for six months of 1908 I have received $617.42. If the average continues the same until the end of 1908, the amount received during this year will be $1,234.84; so you see I have about doubled the receipts each year since I began keeping records: 1906, $364.08; 1907, $759.95; 1908 (if the average continues), $1,234.84, and I think it will be more. If I had not begun the work I would have been, most likely, milking the same old herd of 1906. Of course, the record shows more profit than actual money received, because it does not allow for the butter, cream or milk used in the home, or whole milk-fed calves, but there is not a great difference.

I have sold several male calves from my herd at a good price, being able to show the purchasers their mothers' exact records. That's where the record pays again. There will be no trouble selling bull calves from a cow with a good record, which I consider a great item in the business. They will not do for beef, and ought to go to help some man improve his herd, as the bull is half the herd; but if you do not have a record, you are sending out a calf which will perhaps be an injustice to yourself and the purchaser.

Another thing, you can keep track of your milkers; if they are not milking clean, or mistreating your cow, she will show it in the weight of milk, and the milkers take more interest trying to make their cows give most or beat someone else's; but it is not always the milker's fault if the weight runs down. If the cow is not feeling well or, through carelessness, is turned out in the cold rain or snow, not sufficiently watered, given ice water, dry pasture, and numerous other careless things, she will be short in milk, and test low. If you do not keep a record you cannot detect these things so quickly. If the weight of the milk runs down much, you begin to investigate. These may seem small at the time, but at the end of the year the record shows them up to look like mountains.

Of course, the feeding must also be governed by the record. You can look at it and see what the cow is giving. You know a cow ought to be fed in return for what she has given you. Without the feed record how could we get the profit, or even learn what to feed and how much? We would run from year to year and never know which cow cost us most.

It is natural, when a man improves one thing, for him to improve others, so the cows were taken out of the old shed and put in a new barn; a silo was built for better feed and more of it; the hogs were taken out of their muddy pen and put into a new house with a concrete floor; the horses were moved into another new barn with many more conveniences. The dairy house was somewhat improved and a gasoline engine installed. I thought gasoline cheaper than muscle, and attached the separator, churn, pump and wood saw to it. Water is now pumped to all the barns and the house. The old fence seemed to need a lift, and the farm roads needed the pick and shovel. It seemed, too, that the fields called for improved machinery; so many improvements have been made, with valuable suggestions from the Department of Agriculture.

There is still room for many more improvements, but these have already had their influence over my neighbors, and there are new separators in the neighborhood, barns and silos going up and record work begun.

Without the scales and Babcock tester, I do not know of any way in the world that you can build up a herd that you will be proud of in the future. We are not in the business simply to milk, for it is twice every day, and, as Mr. French has said, "All dairymen are bowlegged from holding the milk pail 365 days a year." It does not cost any more to attend a good herd than a poor one, and I am sure the profit pays you in many ways.

If a man will keep a record of his herd for one year he will be no worse off at the end of the year, but much benefited. But if then he decides that it is too much trouble to weed out the "boarders," he is too lazy for a dairyman, and will soon go out of business. The quicker the better.

What merchant in the city of Raleigh would think of selling goods without a cost mark and selling price? He would not run long without some book work, and all we dairymen would be ready to criticise and say : "There is a man who didn't know how to run his business, and failed."

Now, my brother, it is just as important for we dairymen to keep an account as for the merchant. How can any man ever run a dairy farm if he does not keep a record of his herd? He will always be making mistakes. He may think old Daisy no good because she gives such a little milk, and she goes on the block, when old Sport ought to have gone instead.

I claim I am on the right track, and if I ever succeed it will be a great pleasure in my old age to sit down and look over the records and think of the old cow with the crooked horn, the stocking-legged cow, or the white-switch cow, and say to my children, "This is the cow that helped to educate you."

RELATION OF LIVE-STOCK FARMING TO SOIL FERTILITY.

By C. L. Newman, Professor of Agriculture, North Carolina A. and M. College.

The subject I am to discuss to-day—"The Relation of Live-stock Farming to Soil Fertility"—is, to my mind, one of greater material importance to the agricultural South than any subject that might be discussed by any man or any body of men. It is both fundamental and perpetual in its relationship to the welfare of this State and to the South. I can say, with reverence and with the conviction of truth, that, should one great commandment be promulgated throughout our Southland for the guidance and for the insurance of a prosperous independence to our farmers, it would be: Thou shalt not till thy soil unless thou also maintain thereon its complement of live stock.

The geological origin of practically all of North Carolina's soils, their anatomy, physiology and topography are such as to render them easily portable under the influence of our heavy rainfall, and that portion, the surface, which possesses the conditions and composition most suitable to plant growth is the first to be removed. The continued use of such soils for the production of hoed crops, and farming systems that prohibit rather than necessitate a covering of vegetation, encourage a rapid decomposition, dissolving out and washing away of the first requisite of our soil's fertility, decomposing vegetation or humus. The paramount desideratum in each and every dependence of the farmer upon the soil is fertility or capacity for plant production—the production of the largest yield of the best quality at the least cost, and at the same time leaving the soil in a better condition of fertility for the production of future crops. Nature, in her production of her crops of vegetation free from the interference of man, whether these crops are the herbage of prairies or giant forests, ever preserves upon the surface of her soil a covering of decomposing vegetation, conserving moisture and physical conditions and supplying organic plant food—ideal conditions for plant growth.

For many years the farming systems and practices of the South have had a tendency to exhaust rather than restore fertility. The South is now in a transitory historical period. The virgin soil, originally prodigal in its yield, has been robbed of fertility representing the accumulations of thousands of years, and the high tariff and exhausting rule of King Cotton find us to-day viewing our hillsides corrugated with gullies and spending millions of dollars for fertilizers that we may temporarily stimulate our abused and wasted soils. In the States west of us are to be found thousands of North Carolinians who, having worn their once fertile fields into gullies, went west to rob other soils, and further west to rob still other soils.

I believe the old South is now going through a period of reconstruction—an adjustment to conditions and to the demands of the times. This reconstruction may now be slow, but its velocity will be accelerated as it progresses towards its culmination; and the three forces, stronger than any others, that will operate in this progress are live stock, manufacturing and commerce. I do not eliminate cotton. Cotton, like the poor, will be with us always.

In 1907 North Carolina produced 268,004 tons of cotton seed. The present relative commercial valuation of nitrogen, potash and phosphoric acid gives this quantity of seed a market value for fertilizing purposes of $3,553,000. Had the farmers of North Carolina bought the amounts of nitrogen, potash and phosphoric acid contained in the cotton seed produced in North Carolina in 1907 they would have paid $3,553,000. The market value of these 268,004 tons of seed was $5,587,893 (according to the United States Census), or this amount would have been paid the farmers had all the seed been sold. Had the 268,004 tons been fed to stock, they would have been worth to the farmers $6,000,000, and, having secured the $6,000,000 of value as a feed, there would have remained for the soil 85 per cent of the fertilizing ingredients of the cotton seed in the resulting excrement, and this excrement would have contained in a most desirable and available form the nitrogen, phosphoric acid

and potash. Thus the combined feeding and fertilizing value of the 1907 crop of cotton seed would have amounted to $9,020,000 to the farmers of North Carolina. The cotton crop of the South in 1897 was 11,200,000 bales and 5,600,000 tons of seed, having a combined feeding and fertilizing value of $144,424,000. At $5 per ton the seed would have brought $28,000,000. The farmers of Mississippi lost $16,632,000 on this one crop, and the farmers of the entire South lost $116,424,000. Why this loss? Because the farmers of Mississippi did not feed their cotton seed to live stock; because the farmers of the South do not keep live stock; because the farmers of the South do not know the value of the South's products or of the South's by-products; because the farmers of the South have for the past century pursued a policy of soil exhaustion rather than a system of soil improvement.

The Mississippi station fed cotton seed to cattle through the winter. The feed used contained nitrogen, phosphoric acid and potash worth $206.20. The fertilizing value of the excrement from these cattle, considered only from a chemical standpoint, was $175.27. The cattle all increased in weight and were in much better condition in the spring than at the beginning of the winter.

The Maine Experiment Station found that the manure from cattle fed one ton of hay was worth $4.38; from one ton of wheat bran, $9.60, and from one ton of cotton-seed meal it was worth $23.66.

The Mississippi station found in an experiment conducted there that a ton of cotton seed fed to cattle gave manure worth $9.09; a ton of cotton-seed meal gave manure worth $19.13; a ton of hulls, $2.54, and a ton of Johnson-grass hay, $3.50. Cotton-seed meal was then selling for less than $20, yet the manure resulting from the consumption of a ton was worth $19.13.

An experiment station found that one acre of soy beans supplied green feed for 10 cows 14.75 days; one acre of corn supplied green feed for 10 cows 19.11 days; one acre of cowpeas supplied green feed for 10 cows 22.27 days; one acre of sorghum and cowpeas supplied green feed for 10 cows 34.24 days. The same station found that sorghum and cowpeas from one acre gave 42,948 pounds of green forage, equal to 8,845 pounds air-dry matter containing 669.39 pounds of protein. Reported yields from eight Southern States exceed these yields by more than 30 per cent.

The Arkansas station used on one acre a crop of cowpeas and cotton seed, applied directly to the soil as a fertilizer, and secured a profit of $13.61 per acre from a cotton crop that followed. On another acre the cowpea vines and the same quantity of cotton seed were fed to steers and the resulting manure applied to the soil. The profit from the increased weight of the steers and from the cotton crop was $24.57, a difference of $10.96, which would have been lost had the cowpea crop and the cotton seed not been fed.

The same station has conducted numerous live-stock and soil-improvement experiments, and, without an exception, the growing of cattle and hogs in conjunction with the growing of field crops shows a profitable increase in the yield of the crops and a profit from feeding and grazing the crop. Cotton following corn and peas grazed by the steers gave a yield of 1,675.5 pounds of seed cotton, as compared with only 1,049 pounds of seed cotton from following corn cut for stover. Corn following corn grazed by steers gave a yield of 35.8 bushels per acre, and corn following corn removed as stover gave only 21.8 bushels per acre. Oats following corn and peas grazed by steers gave 2,200 dry matter per acre. When the corn was cut and removed, the yield of dry matter was only 1,012, a decrease of more than 100 per cent. Similar experiments were carried on by the same station with peanuts, chufas, soy beans and corn grazed by hogs, with a resulting increase in the yields of crops, amounting to from 22 to 108 per cent, and a satisfactory profit from the hogs.

The Arkansas station, in various experiments conducted by Bennett, shows that, without an exception, when cattle and hogs were grown in wise association with common Southern field crops, the result was profit in three counts: First, the crops were grown with profit; second, the cattle and hogs were fed with a profit; third, the fertility of the land was rapidly increased without cost. These experiments were executed without the use of commercial fertilizers, and the hogs, with only an average daily gain of 1.15 and 1.31 pounds, produced pork at a low cost of 1½ cents per pound. Grazing tests made by this station show that land which will produce 25 bushels of corn per acre will

in peanuts, produce 1,252 pounds of pork per acre and leave the soil in an improved condition of fertility. Hundreds of such incidents might be cited from various experiment station reports and from the agricultural press. Few men will deny that rotation and diversification are cardinal bases of successful agriculture, and that rational rotation and diversification cannot be practiced unless the production of live stock enters largely into every farming system. When the States of the West and the Northwest discovered that the continuous growing of wheat and corn was draining their lands of fertility, they resorted to the live-stock industries, and now they supply the world with not only grain, but animal products, and their soil is again rich and their people rich.

On January 1, 1906, North Carolina had 282,600 milch cows, valued at $24.

On January 1, 1906, North Carolina had 445,954 other cattle, valued at $12.

On January 1, 1906, Ohio had 719,100 milch cows valued at $34.

On January 1, 1906, Ohio had 1,105,380 other cattle, valued at $22.

On January 1, 1906, North Carolina had 223,965 sheep, producing 871,250 pounds of wool.

On January 1, 1906, Ohio had 1,850,000 sheep, producing 11,562,500 pounds of wool.

On January 1, 1906, North Carolina sheep averaged 4.25 per cent of wool.

On January 1, 1906, Ohio sheep averaged 6.25 per cent of wool.

On January 1, 1906, North Carolina had 1,291,781 hogs, valued at $6,846,455.

On January 1, 1906, Ohio had 2,436,797 hogs, valued at $20,103,575.

Throughout a very large portion of the cotton-producing area are to be found thousands upon thousands of acres of land that should never have been cleared. The rolling character of this area, under our system of cotton culture, has brought over thousands of acres to a cursed condition of yawning gullies and abandonment. The piedmont section of our Southern States was wonderfully endowed by nature, but our system and practice in the pursuit of agriculture have vandalized the forests and prostituted a once fertile soil. We now see and feel our sins, and it is our privilege and duty to repair the wrong we have done. I confidently affirm that we can do this in no way other than by the growing of live stock. Less labor will be required. We have the soil, the climate and water. We have feed stuffs (or can produce them) in such abundance and variety that we are puzzled to know which to select. If other sections of our country, producing 500 per cent more animal products than these sections consume, can find markets, we surely can find them, since millions of our cotton dollars are sent in exchange for mummied, embalmed and renovated products of the hog and the steer.

We can have pasturage and soiling crops for nine months in the twelve. Our short and mild winters do not necessitate expensive barns and stables. I can see but one obstacle in the way of our becoming a great live-stock producing section. That obstacle is brains—or the lack of them. Education, intellect, training and a determination to arise from our lethargic inaction, see and seize the opportunity within our grasp.

When, some forty years ago, the scarred Confederate soldiers returned to the deserts of their once exuberant homes, they had contracted the fighting habit, and ever since they and their descendants have been fighting—fighting grass. I have spent several months of the time since July, 1904, holding Farmers' Institutes in the section of the South where the reign of King Cotton is all but absolute. In and around thousands of acres that I passed through or by were growing grasses, legumes and weeds that, on many a farm, at least, could have been converted into animal products that would have netted more money than the profits from the cotton grown on these farms.

The character of our soils under the influence of our heavy rainfall permits more plant food to be washed or leached from our bare cotton fields than is removed in the average crops through five years. A covering of vegetation not only prevents to a very great extent this loss, but also prevents the formation of gullies and the removal of our soil to the Atlantic Ocean. The character of the plants best adapted to live-stock farming is such as to reduce this loss to a minimum. Many of the crops found to be best for hay, pasturage, soiling and ensilage are legumes, and all legumes are soil improvers. The soil that yields an abundant crop of legumes is thrice-blessed—it yields a rich food for live stock, a profit for the owner of the land, and the land itself is enriched.

Into whatever country it goes, cotton-seed meal, at $30 per ton or at $35 per ton, is considered one of the cheapest and best of dairy foods or for fattening purposes. If cotton-seed meal is shipped a thousand miles and there known as the cheapest and best source of protein, if the animal products resulting from its use are shipped to us and sold at a profit, are we not sending our goose to lay the golden egg in a nest not our own?

There was a time when cotton gins were so located as to permit the seed to fall into some stream of water that they might be carried out of the way. The use of cotton seed or cotton-seed meal directly as a fertilizer is also a practice most wasteful and unwise, since its feeding value of thirty or thirty-five dollars per ton is lost. The same principle may be applied to the plowing under of cowpea vines or other green manurial crops. A ton of cowpea hay is worth on the market anywhere from $12 to $25, the price depending upon the locality and the ignorance or wisdom of the purchaser or seller, or both. Its feeding value is equal to that of wheat bran. The relative commercial fertilizing value of a ton of cowpea hay is between $10 and $15; if used as a fertilizer without having been fed, from $12 to $25 of its total value is lost.

The manure dropped by a well-fed cow in one year contains nitrogen, phosphoric acid and potash worth $27. The average value of the North Carolina cow is between $25 and $27. This is food for thought—a spur to action.

But the growing of live stock in North Carolina or in any land does not mean the rearing of razor-back hogs, saw-back cattle and imported mules. Some years ago, while attending a State fair, I was standing by a pen in which were confined three very fine Berkshires. They were from the North. I admired the hogs greatly, for they were the largest I had then seen. A Georgia farmer came up with his wife, and, after standing for some time, exclaimed to his wife: "Golly! ain't he a buster? As long as a fence rail and as big as a hogshead. He must be old enough to vote." The hog was not two years old. That day four car loads of hog meat were unloaded in Atlanta, consigned to three firms and distributed throughout the State. There may have been more than four car loads. There was more in Georgia. Do Asheville, Greensboro, Charlotte, Raleigh and Wilmington import meat?

North Carolina is a great State, and deserves to be greater. Does North Carolina teach her sons the things the men of North Carolina should know? Do the people of North Carolina realize that North Carolina is an agricultural State? Does North Carolina grow her own meat, butter, corn and flour? Does she spend hard-earned dollars for commercial fertilizers? How many gully-scarred acres have blushed in their nakedness until Dame Nature, moved to compassion, clothed them with broomsedge, briar and pine? Do the farms of North Carolina maintain their complement of live stock? They do not, and until they do, the sins of our fathers will be visited upon us.

MANAGEMENT OF DAIRY HERD.

By John Michels, Professor of Animal Husbandry and Dairying, A. and M. College.

One of the most important matters in the successful management of a dairy herd is to be constantly improving the quality of the stock. This is best accomplished by the use of the best quality of pure-bred dairy sires. The importance of the dairy sire is recognized in the expression, "The bull is half the herd." Usually, however, the bull is more than half the herd, either for good or bad. In the case of common or grade cows, for example, the pure-bred sire may count for three-fourths or more of the herd, by reason of his greater prepotency. To so great an extent does the sire determine the improvement or

deterioration of the herd as to call for the utmost caution in his selection, which should be based primarily upon the performance of his immediate ancestors.

Whether the cows be grades or pure breds, it is of the highest importance in building up a dairy herd to secure a pure-bred sire of outstanding dairy merit. Unless the sire is descended from good milkers, it is folly to expect him to produce good milkers, no matter how fine or how ideal he may be as an individual. It is, furthermore, of importance to remember that the herd cannot be successfully built up unless the sires that are successively used belong to the same breed. If the grading-up is begun with a Jersey sire, the process must be continued uninterruptedly by the use of Jersey blood.

Another matter of prime importance in the successful management of a dairy herd is the keeping of a record of the milk and butter fat produced by the individual cows of the herd. The keeping of a daily record of the weight of the milk of each cow is a very simple and inexpensive task. All that is necessary is to have a small scale and a ruled sheet of paper upon which to record the weights of milk morning and night. The daily weighing of the milk from each cow is valuable also in serving as a check upon the work of the milkers. A rapid shrinking of the milk is usually detected on the milk sheet, and may be entirely due to careless milking. Great daily fluctuations in the yield of milk are also, in most cases, the result of indifferent and inefficient milkers. The milk from each cow should be tested about once a month during the whole period of lactation. A satisfactory way of doing this is to collect what is known as a composite sample, which consists in securing about one-half ounce of milk from each of six consecutive milkings and placing this in a half-pint composite-sample jar containing a small amount of preservative. The test of this composite sample will represent the average amount of butter fat for the period during which the sample was taken, and will serve with sufficient accuracy as an average test during the entire month.

By keeping a record of this kind it will be found that the owner of practically every herd is keeping cows which do not pay for their feed, and the only sure way of locating these cows is in keeping records as outlined above.

Another important matter in the building-up of a dairy herd is to select calves from the best milkers and to cull out the poor cows which by the records have been found to be paying either no profit at all, or only a small one. The selection of calves from the best cows is the only sure and safe way of making any permanent improvement in the dairy herd. The practice of continually buying cows is not only costly, but is also a means of introducing contagious diseases into the herd.

Now, a word with regard to the subject of feeding. I wish to say at the outset that no dairyman can farm successfully who does not raise his own roughage. The man who continually depends on cotton-seed meal and cotton-seed hulls can never expect to attain a high degree of success in the dairy, not alone because of the high price of the hulls, but because of the unsatisfactory combination of these two feeds.

The cheapest and most satisfactory roughage that can be produced upon the farm is corn silage. Its succulence and palatability make it an ideal feed for milk production. This feed should be available upon the farm the larger portion of the year. In the winter it takes the place of some of the pasturage; in the summer and fall it is needed to supplement the shortage of pasturage which usually occurs about this time.

Cows giving a large flow of milk should be fed an ample allowance of grain. It always pays to feed a cow to the limit of her capacity. As a rule, 50 per cent of the total nutrients required by a dairy cow is necessary to maintain her own body, so that it will neither gain nor lose in weight. The other 50 per cent is converted into milk. If the farmer, therefore, feeds the cow three-fourths, or 75 per cent, of the amount of feed that the cow requires for her best milk production, he may in that case expect approximately only one-half the amount of milk that he would get if he supplied the remaining one-fourth or 25 per cent of the feed. It is one of the costliest things in the management of a dairy herd to underfeed cows.

PROFITABLE BUTTER MAKING ON THE FARM.

By R. L. Shuford, Catawba County.

To make butter profitably on the farm as well as in the larger dairy we must first have good cows. Every manufacturer of goods on the market knows that in order to make the most profit he has to have the very best machine possible for that business, and it must be kept in the best running condition. Constitutional vigor in a dairy cow, the machine that we have on the farm for doing this dairy work, is something that we cannot pour into an animal with a bottle; it has to be bred in her and fed into her. What are some of the first steps in breeding animals to secure this constitutional vigor we desire and must have to make the most out of our business?

First, breeding from nothing but strictly healthy animals. We do not want anything but strictly healthy dairy cows to raise dairy stock from. After we have healthy cows, we should know their capacity. Everything should be measured by its capacity for work, or, in case of the cow, by her production. A man is paid, or ought to be paid, for his ability to work, either with his mind or muscle. The value of a race horse is measured by his record. The value of the dairy cow depends upon her capacity to produce butter and milk at a profit. So the first thing we ought to do is to use the scales and Babcock tester and find out whether old Brindle is paying or not. If we were dairying for fun it might be all right not to know this; but if for business, we must use business methods. It is not enough to know that a cow gives a pail full of milk when she is fresh; we want to know what she produces in a year. To make butter profitably on the farm it is very important to know these things, because the small dairyman will have to breed and raise his cows, and if he acts wisely there is no reason why he cannot breed as good or even better than the larger breeder, as he can give the herd his personal supervision, while the large breeder has to depend on hired help, which in most cases will not take the interest that the owner would. I have been asked often whether or not a mule colt could not be raised to maturity as cheaply as a cow. My answer to this is, it probably can be, but why not raise a cow that will bring as much as a mule? This I have tried, and believe I have succeeded in doing.

To get the most profit out of butter on the farm it is necessary to do it in a co-operative way. Get several of your neighbors interested. This is particularly necessary when the market is not convenient and the product has to be shipped, as it is rather expensive to ship a small amount often, which it is very necessary to do in order to get the best price. By combining the shipments the cost can be very much reduced, as each can do this in turn. It will be quite a while yet before creameries of any size can be run to any advantage. We will first have to get more people interested in keeping cows, but with the hand separator and proper handling of the cream there is no reason why we cannot make just as good butter, or even better, on the farm. If we try to learn, and have conditions right, we can be sure to turn out the best product. Our people should be educated to make a better quality of butter, as this will greatly increase the consumption. When there is a lot of inferior butter on the market, people use but little of it. I was once told by one of my customers that the only objection he had to my butter was "that it took too much of it," that he used double the amount that he did of cheap butter. However, this man is still buying the best butter he can get for family use and paying the difference in price.

Co-operation with your neighbors will also greatly help in breeding up better dairy cattle. By co-operating, we can buy the best sires and change our breeding without so much expense. I think every dairyman, it matters not how small his business, should make an effort to breed registered stock, as it does not cost any more to raise them, and when he has a surplus there is so much more profit in what he sells.

One among the most noted Jersey breeders in America to-day is a man who only keeps eighteen to twenty cows. He has bred and developed some among the largest producers. On the Island of Jersey the breed has been developed by small dairymen through co-operation. If the average farmer could get rid of his prejudices and false notions about registered stock and be persuaded to give up saying this, "They say grades are worth just about as much for business as registered stock," he would put himself far along on the road toward the improvement of his cows and a big increase in their earnings. They seem to stick to their notion that the haphazard cow is really better and more profitable for them than a cow born of an improved sire and dam. The same low grade of judgment prevails upon the subject of feeding. Many people really think they cannot afford to feed their cows well. It is true that no man can afford to buy feed, or raise it, either, for poor cows, but it is certainly true that no man can afford not to feed a good cow the right food and all she will eat and digest.

MARKETING MILK AND CREAM.

By William D. Saunders, Dairy and Food Commissioner of Virginia.

Our cities, for the most part alive to the interests of the health of their citizens, have established boards to control to a certain extent the production of the milk coming within their municipalities for consumption, the danger being that diseases of various kinds are frequently transported in milk and produce their characteristic troubles when taken into the intestinal tract, the principal requirements for the present being more cleanly methods in the production of the milk and freedom of the cows from disease. Some dairymen seem to resent interference on the part of the city authorities with their arrangements, while others are willing and eager to meet the requirements and do what the boards of health regard as necessary to be done in the interests of the health of the different cities.

I will deal with this question first, so far as it concerns the dairyman who is trying to supply cities with such milk as will satisfy their health officers and protect the consumer, so far as science indicates that it can be done. I think I will take a text at this point, as there are two words I want to impress on you, and want you to hold to and practice what I am going to say in connection with them:

CLEANLINESS AND COLD.

Cleanliness about the stable, in the first place, is most important. We want our stable where the drainage is good; we don't want mud around it so deep we can hardly get through it all winter. We want the stable itself arranged so that it can be kept clean. Cement floors, with gutters for carrying off all liquid material, are most important. The stable should be cleaned out as often as necessary to get out all material and keep the floor clean. It is just as easy to clean the floor once daily as once a week, and twice daily as once. Getting in the habit of doing it is all that is necessary. We are all victims of habit. If we ever get in the habit of doing anything, we find it is all right. Another practice of keeping the dry feed over the cows is one that should be changed when new barns are being built, and for several reasons. When the forage is being fed, a considerable dust is raised in the barn, which is not good for the cows, and also tends to infect the milk, to some extent, with germs that, while they may not be harmful, had better be kept out. More light is wanted, as well as more air. Light, especially sunlight, tends to destroy germs and moulds, which might cause trouble and which may be present in the barns. Plenty of light and ventilation also tend to bring about better conditions of health amongst dairy cows. Cows, when milked, should first be

brushed off along their sides and udders, their sides and udders dampened, so that as little contamination as possible will get into the milk from this source; hairs from the sides of the cow, dandruff from the udder and dirt and dung from the tail will add foreign material to the milk, carrying more or less germs of various kinds that should be and can be kept out. The pail in which the milk is drawn should be carefully washed and sterilized before any milk is drawn into it. This is again a source of contamination. Steam is essential for sterilizing all vessels used in handling milk. A small boiler costing about $25 will answer every purpose and drive a small turbine separator, if desired. The dairyman who is undertaking to provide a milk free from most objectionable features should, in the first place, provide good healthy cows. These cows, if it is practicable to be done, should be tested for tuberculosis regularly, as there seems to be a growing demand that only milk from cows tested and not reacting be allowed to be sold in our cities and towns. Whatever we may think of tuberculosis and its transmissibility from cattle to human beings, one thing we are all agreed upon, and that is its contagious character as to cattle. One case in a dairy herd threatens the entire herd, and sooner or later every cow in a herd may contract tuberculosis from one tuberculous animal. Knowing this, are we not as much interested in controlling this disease as anyone else who may be trying to lessen the possible risk of contracting this disease through the milk? We should observe cleanliness about the barn, cleanliness about the cows and cleanliness in handling the milk after it is taken from the cows. As soon as the milk is drawn, it should be removed from the stable and to the milk room. The milk room should be located some little distance from the barn—far enough to be free at all times from the odors about the barn, and as far as possible from the flies that are around a stable at all times. In order to get rid of the flies as far as possible, screens should be provided for all the openings to the milk room, and kept closed, except when it is necessary to open the room. As soon as the milk is taken to the milk room it should be strained through two thicknesses of cheese cloth to remove whatever may be in it which may have gotten in in spite of whatever precautions may have been taken; these strainers should be carefully cleaned and sterilized by boiling, if used again, or, what would be better, discarded each time after being used. The better way, however, to cleanse milk is to pass it through a cream separator, the separator holding all the foreign matter which may have gotten into the milk, except what may have gone into solution in the milk. As any strainer, from the nature of the case, is composed of material with small holes, allowing the milk to pass through, it can be seen that sufficiently small material will pass through with the milk when the milk is strained. In the case of passing milk through the separator, practically all solid matter is held in the separator bowl. Immediately after the milk is cleansed, whether by passing through a separator or straining, it should be cooled to as low a temperature as possible, short of freezing, and even some freezing would make no difference. This can be accomplished by using a Champion milk cooler, or a cooler of this type, and plenty of ice, reduced as fine as practicable, and with water to float it; filling the entire cooler with the ice and water, this is stirred at short intervals while the milk is slowly run over the outside, reducing the temperature of the milk to near the temperature of the water and ice in the cooler. If one passing of the milk over the cooler does not reduce the temperature sufficiently, then it can be repeated. One passing over will usually reduce the temperature to about 35 degrees Fahr., or below. This temperature should be maintained until the milk is delivered. To do this the milk should be placed in a tank with plenty of ice and water surrounding the can containing the milk and held at a temperature as near 33 degrees F. as possible until delivery is made. When ready to ship, the can should be surrounded with some nonconducting material, so that the temperature of the milk will be held as near as possible to what it has been brought to until delivered; this is done by using felt jackets, which are made specially for this purpose, strapped tight to the cans, holding the temperature, with very slow rise, during the period of delivery. While ice is an essential, almost, to the successful handling of milk and cream, a great many dairymen do not provide themselves with ice, and cannot, for that reason, handle their milk as has been suggested. In such cases they should use as cold water as

may be available, and reduce the temperature of their milk to as near the temperature of the water as possible; this can be done by using a Champion milk cooler and running the water through it while the milk is running over it. The Star milk cooler is a very good cooler to use, when it is desired to use water only to cool with. The temperature of the milk, if passed over either cooler slowly, will be reduced to near the temperature of the water used.

The proper cleaning of all vessels used is very important; some fat solvent should be used in the water. Sal. soda makes a very satisfactory material for this purpose, and all vessels used should be washed in this solution; the first water should be cold and the next as hot as the operator can stand. As soon as the vessels are washed they should be rinsed in hot water and placed over a steam pipe, allowing the steam to run slowly into the can or vessels and remain heated in this way for several minutes; this provides sterility or destruction of whatever germs may be present in the corners or crevices of the vessels from which they cannot be dislodged by washing.

I will now endeavor to indicate how to prepare milk and cream for market in large quantities. It will not be necessary to repeat the method of handling the milk only after it has come to the creamery, the method up to this time being practically the same as far as it is possible to do it. As soon as the milk comes to the milk plant—not more than an hour or so should elapse before getting it to the plant—it should be treated so that it will be changed but little, if any, from what it was when received. The proposition, then, is to maintain this condition until the milk is put into the hands of the consumer; to do this it is necessary to destroy the germ content of the milk as far as possible, as milk two or three hours old contains large numbers of bacteria; to destroy these bacteria and not affect materially the taste of the milk is what is desired to be done. This can be done by raising the temperature of the milk to from 140 to 160 degrees F. and maintaining this temperature a sufficient time to destroy the bacteria present; this period will be longer in the case of the lower temperature; twenty minutes at 160 degrees F. destroys practically all bacteria present in milk. This treatment is called pasteurization. After the milk has been pasteurized, the germs being practically destroyed, a condition of temperature should be provided which will prevent the growth of such bacteria as may get in afterwards. This we do by reducing the temperature of the milk to a point at which the bacteria cannot develop—or as near 33 degrees as possible. To maintain this temperature until delivery, the milk is frozen to some extent, about ten to twenty per cent of the can being frozen; this, with the protection the felt jackets give, will maintain the temperature from 12 to 15 hours at about 33 to 35 degrees F. It is understood that such precautions in the way of washing and sterilizing all vessels used in connection with handling the milk, both before and after pasteurizing, as has been indicated, are most important. After the milk or cream, as the case may be, has been pasteurized and partly frozen, it can be held in cold storage at a temperature of 30 degrees F. for several days without its condition being affected but very slightly. Milk and cream prepared in this way can be handled between points which can be reached within 36 hours very successfully; in fact, our creamery at Blacksburg has shipped cream prepared for shipment as has been indicated, to points requiring 36 hours to make delivery. Cream has been shipped, prepared for shipment as has been indicated, from the creamery at V. P. I. to Palm Beach, Fla., a distance of 1,200 miles, requiring 36 hours for delivery; to New Orleans, La., 800 miles, and requiring about 24 hours; also to Little Rock, Ark., and various points in North Carolina—from the mountains in the west to the seacoast on the east. Milk treated in the above manner could be as successfully handled as cream.

REPORT ON FOOD ADULTERATION FOR 1908.

B. W. Kilgore, State Chemist.

By W. M. Allen, Food Chemist,

Assisted by Hampden Hill.

A general statement, an extract from the State Food Law, the rulings of the Board of Agriculture on labeling, and the results of the examination of food products for the year 1908—constituting the ninth annual report under the Food Law—are presented on the following pages:

GENERAL STATEMENT.

When of general interest, analyses will be made for parties within the State, if samples are taken in accordance with instructions furnished by the Department and the required data concerning the samples are given.

Results of analyses are sent to parties sending samples and parties from whom samples are obtained by the Department, as well as the manufacturer of the products.

It is the desire of the Department to put information into the hands of manufacturers, dealers and consumers of food, and to assist them in every way it can to know and manufacture, handle and use the best, most desirable and most wholesome food products. The Food Control is in the interest of the honest manufacturer, the honest dealer, and for the protection of the consumer.

EXTRACT FROM FOOD LAW.

The following extract from the Pure Food Law is very important, and the same is herewith printed in order that the grocerymen may become more familiar with the requirements of the law.

State Food Law, section 6, defines and describes what constitutes food adulteration. Section 7 defines and describes what constitutes the misbranding of food products. Section 9 provides for a guaranty by which the retail dealer may be exempt from prosecution for violation of the law.

EXTRACT FROM STATE FOOD LAW.

Sec. 6. That for the purpose of this act an article shall be deemed to be adulterated, in the case of food—

First. If any substance has been mixed or packed with it, so as to reduce or lower or injuriously affect its quality or strength.

Second. If any substance has been substituted wholly or in part for the article.

Third. If any valuable constituent of the article has been wholly or in part abstracted.

Fourth. If it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed.

Fifth. If it contains any added poisonous or other added deleterious ingredient which may render such article injurious to health. If it contains any of the following substances, which are hereby declared deleterious and dangerous to health when added to human food, to-wit: Colors which contain antimony, arsenic, barium, lead, cadmium, chromium, copper, mercury, uranium, or zinc; or the following colors: gamboge, corallin, picric acid, aniline, or any of the coal-tar dyes; dulcin, glucin, or any other artificially or synthetically prepared substitute for sugar except saccharine; paraffin, formaldehyde, beta-naphthol, abrastol, benzoic acid or benzoates, salicylic acid or salicylates, boric acid or borates, sulphurous acid or sulphites, hydrofluoric acid or any fluorine compounds, sulphuric acid or potassium sulphate or wood alcohol: *Provided*, that catsups and condimental sauces may, when the fact is plainly and legibly stated in the English language on the wrapper and label of the package in which it is retailed, contain not to exceed two-tenths of one per cent of benzoic acid or its equivalent in sodium benzoate. Fermented liquors may contain not to exceed two-tenths of one per cent of combined sulphuric acid and not to exceed eight-thousandths of one per cent of sulphurous acid.

Sixth. If it consists in whole or in part of a filthy, decomposed or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal or one that had died otherwise than by slaughter. In addition to the ways already provided, sausage shall be deemed to be adulterated if it is composed in any part of liver, lungs, kidneys or other viscera of animals: *Provided*, that the use of animal intestines as sausage casings shall not be deemed to be an adulteration.

Seventh. If it differs in strength, quality or purity from the standard of purity of food products that have been or may be from time to time adopted by the Board of Agriculture.

Sec. 7. That the term "misbranded," as used herein, shall apply to all drugs or articles of food, or articles which enter into the composition of food, the package or label of which shall bear any statement, design or device regarding such article or the ingredients or substances contained therein which shall be false or misleading in any particular, and to any food or drug product which is falsely branded as to the State, Territory or country in which it is manufactured or produced.

That for the purpose of this act an article shall also be deemed to be misbranded, in the case of food—

First. If it be an imitation of or offered for sale under the distinctive name of another article.

Second. If it be labeled or branded so as to deceive or mislead the purchaser, or purport to be a foreign product when not so, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in such package, or if it fail to bear a statement on the label of the quantity or proportion of any morphine, opium, cocaine, heroin, alpha or beta eucaine, chloroform, cannabis indica, chloral hydrate, or acetanilide, or any derivative or preparation of any such substances contained therein.

Third. If in package form and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package.

Fourth. If the package containing it or its label shall bear any statement, design or device regarding the ingredients or the substances contained therein, which statement, design or device shall be false or misleading in any particular: *Provided*, that an article of food which does not contain any added poisonous or deleterious ingredients shall not be deemed to be adulterated or misbranded in the following cases:

First. In the case of mixtures or compounds which may be now or from time to time hereafter known as articles of food under their own distinctive names, and not an imitation of or offered for sale under the distinctive name of another article, if the name be accompanied on the same label or brand with a statement of the place where said article has been manufactured or produced.

Second. In the case of articles labeled, branded or tagged so as to plainly indicate that they are compounds, imitations or blends, and the word "com-

pound," "imitation," or "blend," as the case may be, is plainly stated on the package in which it is offered for sale: *Provided*, the labeling is according to the rules prescribed by the Board of Agriculture: *Provided*, that the term "blend," as used herein, shall be construed to mean a mixture of like substances, not excluding harmless coloring or flavoring ingredients used for the purpose of coloring and flavoring only.

SEC. 9. That no dealer shall be prosecuted under the provisions of this act when he can establish a guaranty signed by the wholesaler, jobber, manufacturer or other party, residing in North Carolina, from whom he purchased such articles, to the effect that the same is not adulterated or misbranded within the meaning of this act, designating it.

RULINGS OF THE STATE BOARD OF AGRICULTURE UNDER THE FOOD LAW IN REGARD TO LABELING FOOD PRODUCTS.

A label must be, as far as possible, attached to each package, and contain, in addition to other information, the name of the material, the name and address of the manufacturer, importer or jobber. When the words "artificial," "imitation," "compound," "adulterated," or other words of similar import, are required, they must be on the principal label and immediately precede or follow the word or words they modify, which must be the principal word or words of the label, and be in at least half the size and same style of type and on the same kind of background as the word or words with which they are closely associated. The principal words in the label must be printed in either dark-colored letters on a light-colored background or light-colored letters on a dark-colored background. Any statement that is required on the principal label of a barrel or cask of molasses, molasses compound, syrup or compound syrup, vinegar or compound vinegar, must appear on one end or head of the barrel or cask; and if the principal label or any part of it appears on both ends of barrel or cask, they shall be identical, one to the other.

The label on bottled soft drinks must bear the name and address of the bottler.

Where the presence of preservatives, coloring matter or other substance or substances is required to be printed on the label, the printing must be done clearly and conspicuously on the label, in type not smaller than *brevier heavy gothic caps*, and on the same kind of background as the rest of the label.

Retail dealers, while offering food or beverage for sale, must keep the label so that it may be seen by purchaser or inspector, and the label must be so kept that it will remain legible.

RESOLUTIONS.

The following important resolutions were adopted by the Association of State and National Food officials at their last annual meeting:

Resolved, That this Association is unalterably opposed to the bleaching of flour by the oxides of nitrogen or other chemicals.

Resolved, That this Association is convinced that all chemical preservatives are harmful in foods, and that all kinds of food products are and may be prepared and distributed without them, and pledges its best effort to use all moral and legal means at its disposal to exclude chemical preservatives from food products.

BLEACHED FLOUR.

The Secretary of Agriculture of the United States has just issued a decision regarding the bleaching of flour, which is in part as follows:

Flour bleached with nitrogen peroxide, as affected by the Food and Drugs Act of June 30, 1906, has been made the subject of a careful investigation extending over several months.

A public hearing on this subject was held by the Secretary of Agriculture and the Board of Food and Drug Inspection, beginning November 18, 1908, and continuing five days. At this hearing those who favored the bleaching process and those who opposed it were given equal opportunities to be heard.

It is my opinion, based upon all the testimony given at the hearing, upon the reports of those who have investigated the subject, upon the literature, and upon the unanimous opinion of the Board of Food and Drug Inspection, that flour bleached by nitrogen peroxide is an adulterated product under the Food and Drugs Act of June 30, 1906; that the character of the adulteration is such that no statement upon the label will bring bleached flour within the law, and that such flour cannot legally be made or sold in the District of Columbia or in the Territories, or be transported or sold in interstate commerce.

In view of the extent of the bleaching process and of the immense quantity of bleached flour now on hand or in process of manufacture, no prosecutions will be recommended by this Department for manufacture and sale thereof in the District of Columbia or the Territories or for transportation or sale in interstate or foreign commerce for a period of six months from the date hereof.

The sale of flour bleached by nitrogen peroxide is regarded as a violation of the State Food Law, and after June 1, 1909, the sale of flour so bleached will be prohibited in North Carolina.

SUMMARY OF RESULTS FOR COMPARISON.

For convenience of comparison of the work for the nine years, and to show at a glance the products which have been examined, and the extent of adulteration of each, a summary of the results by year and by subject is given below:

SUMMARY OF WORK DONE BY YEAR.

1900. No. of samples examined, 507; per cent adulteration found, 56.0.
1901. No. of samples examined, 308; per cent adulteration found, 35.7.
1902. No. of samples examined, 589; per cent adulteration found, 21.3.
1903. No. of samples examined, 477; per cent adulteration found, 32.1.
1904. No. of samples examined, 347; per cent adulteration found, 17.0.
1905. No. of samples examined, 317; per cent adulteration found, 42.2.
1906. No. of samples examined, 466; per cent adulteration found, 24.7.
1907. No. of samples examined, 560; per cent adulteration found, 29.82.
1908. No. of samples examined, 730; per cent adulteration found, 16.45.

Total number of samples examined since the law went into effect (1900), 4,301.

Average per cent of adulteration found, 30.58.

Name of Sample.	*Date.*	*Total No. Samples.*	*Per Cent Adulteration.*
Baking Powders	1901	85	18.80
Baking Powders	1902	12	
Baking Powders	1906	64	1.50
Baking Powders	1908	7	
Beers—1900, 1902, etc. See Malts.			
Beers and Imitation Beers	1907	50	6.00
Beers and Imitation Beers	1908	86	4.64
Breakfast Foods	1900	24	4.11
Breakfast Foods	1903	20	
Breakfast Foods	1904	39	
Breakfast Foods	1908	19	

Name of Sample.	*Date.*	*Total No. Samples.*	*Per Cent Adulteration.*
Butter, Renovated Butter and Butterine	1900	11	
Butter, Renovated Butter and Butterine	1902	22	
Butter, Renovated Butter and Butterine	1904	15	
Butter, Renovated Butter and Butterine	1906	20	
Butter, Renovated Butter and Butterine	1908	10	20.00
Canned Fruit:			
Apples	1902	2	
Apples	1908	3	
Apricots	1902	6	17.00
Apricots	1904	1	
Apricots	1908	1	
Blackberries	1902	2	
Blackberries	1904	1	
Blackberries	1908	2	
Cherries	1902	3	33.33
Cherries	1908	1	
Peaches	1902	14	21.50
Peaches	1904	1	
Peaches	1908	5	
Pears	1902	7	8.60
Pears	1904	2	
Pears	1908	2	
Pineapple	1902	3	
Pineapple	1904	3	
Pineapple	1908	2	
Plums	1904	2	
Canned Fish and Oysters	1904	53	1.88
Canned Meats	1904	33	39.39
Canned Vegetables:			
Asparagus	1904	3	
Beans, baked	1900	8	100.00
Beans, baked	1904	3	33.33
Beans, baked	1908	2	
Beans, Lima	1900	8	62.50
Beans, Lima	1904	3	
Beans, Lima	1908	2	
Beans, Snap	1900	9	77.77
Beans, Snap	1904	3	
Beans, Snap	1908	2	
Beets	1904	3	
Beets	1908	1	
Celery	1900	2	
Corn	1900	70	60.00
Corn	1902	56	34.00
Corn	1904	16	43.75
Corn	1905	29	
Corn	1908	2	
Corn and Tomatoes	1900	4	100.00

Name of Sample.	*Date.*	*Total No. Samples.*	*Per Cent Adulteration.*
Canned Vegetables:			
Okra	1900	2	50.00
Okra and Tomatoes	1900	8	100.00
Okra and Tomatoes	1904	3	33.33
Okra and Tomatoes	1908	1	
Peas, Garden	1900	37	81.00
Peas, Garden	1904	6	17.00
Peas, Garden	1908	1	
Pumpkin	1900	8	50.00
Succotash	1900	14	7.14
Tomatoes	1900	55	63.63
Tomatoes	1902	25	24.00
Tomatoes	1904	7	
Tomatoes	1908	10	
Canned Soups	1906	26	
Canned Soups	1907	4	
Catsups and Sauces	1900	43	91.61
Catsups and Sauces	1902	22	100.00
Catsups and Sauces	1903	49	100.00
Catsups and Sauces	1907	11	27.27
Catsups and Sauces	1908	4	25.00
Ciders and Imitation Ciders	1900	3	100.00
Ciders and Imitation Ciders	1902	2	50.00
Ciders and Imitation Ciders	1903	1	100.00
Ciders and Imitation Ciders	1905	33	81.82
Ciders and Imitation Ciders	1908	40	27.50
Cheese	1902	33	6.00
Cheese	1904	11	
Chocolate	1904	10	20.00
Cocoa	1904	14	
Coffee	1900	55	36.30
Coffee	1903	38	
Coffee and Coffee Substitutes	1907	6	33.33
Coloring Matter	1907	7	
Coloring Matter	1908	12	
Condensed Milk	1907	16	
Condiments	1901	44	20.40
Confectionery	1908	42	
Corn Meal	1902	17	
Corn Meal	1903	23	
Corn Meal	1908	20	
Distilled Liquors	1903	3	
Distilled Liquors	1904	14	
Distilled Liquors	1906	28	
Distilled Liquors	1907	6	
Distilled Liquors	1908	30	6.66

Name of Sample.	Date.	Total No. Samples.	Per Cent Adulteration.
Dried and Evaporated Fruit	1906	23	30.44
Fish and Oysters, fresh	1906	14	7.15
Fish and Oysters, fresh	1907	5	40.00
Fish and Oysters, fresh	1908	7	
Flour	1900	37	
Flour	1902	70	1.40
Flour	1903	77	
Flour	1904	59	
Flour	1908	68	
Fruit Butter, Plum	1901	5	100.00
Fruit Butter, Apple	1903	1	100.00
Fruit Butter	1907	6	100.00
Fruit Juice	1900	4	75.00
Fruit Juice	1903	2	100.00
Honey	1901	5	20.00
Honey	1903	6	33.30
Honey	1906	3	
Jams	1901	9	100.00
Jams	1903	14	78.40
Jams	1907	14	28.56
Jams	1908	3	
Jellies	1901	10	100.00
Jellies	1903	14	76.60
Jellies	1907	50	48.00
Jellies	1908	12	
Lard	1900	11	9.00
Lard	1902	32	3.10
Lard, Compound	1902	24	
Malts, Beers, Ales, and Imitations	1900	30	80.00
Malts, Beers, Ales, and Imitations	1902	3	100.00
Malts, Beers, Ales, and Imitations	1903	14	86.00
Malts, Beers, Ales, and Imitations	1905	17	47.00
Malts, Beers, Ales, and Imitations	1906	91	31.68
Malts and Imitation Malts	1907	5	20.00
Maraschino Cherries	1907	8	100.00
Maraschino Cherries	1908	4	100.00
Meats, fresh	1904	12	83.33
Meats, fresh	1906	107	47.66
Meats, fresh	1907	134	7.46
Meats, fresh	1908	13	7.69
Mince-meat	1907	9	27.22
Miscellaneous	1908	21	18.20
Molasses and Syrup	1901	32	81.20
Molasses and Syrup	1903	11	37.50
Maple Sugar	1905	2	50.00

Name of Sample.	*Date.*	*Total No. Samples.*	*Per Cent Adulteration.*
Maple Syrup	1905	15	86.66
Marmalade	1903	3	
Olive Oil and other Table Oils	1900	11	18.18
Olive Oil and other Table Oils	1905	14	
Olive Oil and other Table Oils	1908	6	
Phosphates	1902	6	100.00
Phosphates	1903	3	
Phosphates	1905	2	
Phosphates	1907	7	28.57
Phosphates	1908	3	66.66
Pickles	1907	6	66.66
Prepared Mustard and Salad Dressings	1902	11	90.90
Prepared Mustard and Salad Dressings	1904	37	75.75
Prepared Mustard and Salad Dressings	1906	24	12.50
Preservatives, chemical	1907	31	
Preservatives, chemical	1908	4	
Preserves	1901	11	100.00
Preserves	1903	20	75.00
Preserves and Marmalades	1907	37	37.80
Preserves and Marmalades	1908	7	
Rice	1908	59	
Soda Waters, bottled	1900	33	72.72
Soda Waters, bottled	1902	36	72.00
Soda Waters, bottled	1903	20	25.00
Soda Waters, bottled	1906	7	43.00
Soda Waters, bottled	1907	54	61.05
Soda Waters, bottled	1908	144	54.86
Sugar, white	1901	19	
Sugar, brown	1903	16	
Sugar, white	1903	29	
Sweeteners, Artificial	1908	5	
Tea	1901	25	
Tea	1903	21	33.33
Tapioca	1903	3	
Tonics and Bitters	1900	1	100.00
Tonics and Bitters	1902	3	33.33
Tonics and Bitters	1903	3	33.33
Tonics and Bitters	1905	14	7.14
Tonics and Bitters	1906	13	
Tonics	1907	4	
Tonics	1908	3	
Vinegar	1900	22	59.00
Vinegar	1901	13	30.70
Vinegar	1903	62	29.00
Vinegar	1905	52	34.61
Vinegar	1906	21	47.62
Vinegar	1907	39	30.72
Vinegar	1908	64	15.50

Name of Sample.	*Date.*	*Total No. Samples.*	*Per Cent Adulteration.*
Whiskeys. See Distilled Liquors.			
Wines	1903	5	100.00
Wines	1905	1	100.00
Wines	1906	5	
Wines	1907	2	

WORK OF THE YEAR 1908.

During the year 730 samples of foods and beverages and products used in the manufacture and adulteration of the same have been analyzed. The samples were either sent to the Department by citizens of the State for analysis or were obtained by officers of the Department from various towns in the State.

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1908.

Name of Sample.	Total Number of Samples.	No Adulteration Found.	Number of Samples Adulterated.	Per Cent of Samples Adulterated.	Number of Samples Misbranded.	Number of Samples not Properly Labeled.	Kind of Adulteration.
Preservatives	4	4					
Oysters	7	7					
Tonics	3	3					
Fresh meats and sausage	13	12	1	7.69			Sulphites.
Coloring matters	12	12					
Butters and imitation butters	10	8	2	20.00		1	Oleomargarine.
Oils	6	6					
Soda waters	144	65	79	54.86	68	68	Coal-tar dye.
Baking powder	7	7				2	
Phosphates	3	1	2	66.66			Benzoic acid.
Maraschino cherries	4		4	100.00		1	Benzoic acid, coal-tar dye.
Artificial sweeteners	5	5					
Catsups and sauces	4	3	1	25.00			Coal-tar dye.
Jellies	12	12					
Jams	3	3					
Preserves and marmalades	7	7					
Canned vegetables	21	21					
Canned fruit	16	16				1	
Confectionery	42	42					
Vinegar	64	54	10	15.50	1		Below standard, compound.
Beer and imitation beer	86	82	4	4.64	6	14	Benzoates.
Ciders and imitation ciders	40	29	11	27.50	6	4	Coal-tar dye, benzoates, salicylates.
Distilled liquors	30	28	2	6.66	8		Coal-tar dye, artificial flavor.
Rice	59	59				3	

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS FOR 1908—CONTINUED.

Name of Sample.	Total Number of Samples.	No Adulteration Found.	Number of Samples Adulterated.	Per Cent of Samples Adulterated.	Number of Samples Misbranded.	Number of Samples not Properly Labeled.	Kind of Adulteration.
Meal	20	20	------	------	------	------	
Flour	68	68	------	------	------	------	
Breakfast foods	19	19	------	------	------	------	
Miscellaneous	21	17	4	18.20	------	------	
Total	730	610	120	16.45	89	94	

METHODS OF ANALYSIS.

The methods of analysis of the Association of Official Agricultural Chemists were followed in the examination of the products presented in this report.

MEAT.

(MEAT, SAUSAGE, OYSTERS AND FISH.)

Meat is any clean, sound, dressed and properly prepared edible part of an animal in good health at the time of slaughter. The term "animal," as herein used, includes not only mammals, but fish, fowls, crustaceans, mollusks and all other animals used as food.

Meat is adulterated if treated with any chemical preservative or dyestuff whose use and purpose are to retard, prevent or mask decomposition. In addi-

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5226	Sausage, meat and cereal	Swift & Co., Chicago, Ill.
5227	--do	----do
5248	--do pork	W. S. Forbes & Co., Richmond, Va.
5540	--do	Armour Packing Co., Chicago, Ill.
6119	--do mixed	The Royal Meat Co., Henderson, N. C.
6120	--do	Ross & Scroggins, Henderson, N. C.
6121	--do	B. F. Payne, Henderson, N. C.
6118	Beef	Schwarzchild & Sulzberger Co., Norfolk, Va.
6130	Sausage, mixed	Watson Law, Greensboro, N. C.
6131	--do	J. C. Olive, Greensboro, N. C.
6132	--do Frankfort	Kingan & Co., Greensboro, N. C.
6133	--do mixed	Schlosser & Son, Greensboro, N. C.
6134	Tongue	Watson Law, Greensboro, N. C.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5243	Oysters	S. S. Keeling & Co., Norfolk, Va.
5244	--do	George N. Ives & Son, New Bern, N. C.
5245	--do	A. L. Willis, New Bern, N. C.
5246	--do	W. N. McAnge Co., Suffolk, Va.
5247	--do	----do
6116	--do	----do
6117	--do	Isaac Foss, Portsmouth, Va.

tion to the above, sausage will be regarded as adulterated if it contains liver, lungs, kidneys or other viscera of animals, except intestines used as sausage casings. Thirteen samples of meat were examined, and only one was found to be adulterated, and it contained sulphites.

OYSTERS.

Under the head of meats, according to the standards, come fish and oysters. Under the subhead of oysters, only seven samples were examined, and no adulteration was found.

OF FRESH MEATS AND SAUSAGE.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Adulterants (Chemical Preservatives).	Remarks and Conclusions.
5226	Henry Honeycutt, Raleigh, N. C.	None found.	Contained starch.
5227	J. B. Green & Co., Raleigh, N. C.	do.	do.
5248	M. Rosenthal & Co., Raleigh, N. C.	do.	
5540	F. A. Lloyd & Son, Jonesboro, N. C.	do.	
6119		do.	
6120		do.	
6121		do.	
6118		do.	
6130		do.	
6131		do.	
6132	Schlosser & Son, Greensboro	do.	
6133	do	Sulphites.	
6134	do	None found.	

TION OF FRESH OYSTERS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Adulterants (Chemical Preservatives).
5243	L. M. Waring, Raleigh, N. C.	None found.
5244	C. D. Arthur, Raleigh, N. C.	do.
5245	Britton Pearce, Raleigh, N. C.	do.
5246	G. S. Terrell, Raleigh, N. C.	do.
5247	M. Rosenthal & Co., Raleigh, N. C.	do.
6116	D. C. Locklin, Henderson, N. C.	do.
6117	B. H. Bullock, Henderson, N. C.	do.

BUTTER, RENOVATED BUTTER AND BUTTERINE.

"Butter is the clean, nonrancid product made by gathering in any manner the fat of fresh or ripened milk or cream into a mass, which also contains a small portion of other milk constituents, with or without salt, and contains not less than 82.50 per cent of milk fat. It may also contain added coloring matter, provided the coloring matter is not of coal-tar origin."

"Renovated butter, process butter, is the product made by melting butter and working, without the addition or use of chemicals or any substance except milk, cream or salt, and contains not more than 16 per cent of water and at least 82.50 per cent of milk fat."

Oleo, oleomargarine or butterine is a substitute for butter, made from other and cheaper fats than butter. It is manufactured so as to improve its granulation and texture, and a more or less butterlike flavor and odor are imparted

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5291	Butter	J. L. Thompson, Lilac, N. C.
5318	do	
5551	do	A. G. Higgins, Belwood, N. C.
5623	do	
6061	Butter, Four-leaf Clover	Scott & Co., Norfolk, Va.
6062	Butter, Renovated	do
6063	Butterine	do
6115	Butter	
4463	Butter, Creamery	
4827	Butter, Country	J. A. Arnold, Raleigh, N. C.

to it by churning it with milk, skimmed milk, cream or buttermilk, or possibly by mixing a small amount of butter with it.

In nutritive value oleomargarine is not materially, if at all, inferior to genuine butter. The comparative digestibility of butter and oleomargarine has been found by various experiments to be about the same.

Under this head ten samples were examined, six of which proved to be standard butter, one renovated butter and three oleomargarine. The sample of renovated butter was labeled and sold as renovated butter. No. 4795, oleomargarine, was labeled and sold as such, but No. 6115 was served at a cafe for butter, and No. 5318 was sold as butter.

Retailers often speak of renovated butter as "tub butter" or "cooking butter," and it is often bought and used without the purchaser or consumer knowing that it is the renovated article.

BUTTER AND SUBSTITUTES FOR BUTTER.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Volatile Fatty Acid 10 N. Ba OH c.c.	Reading Refractometer, 40°.	Refractive Index.	Adulterants.	Remarks and Conclusions.
5291	W. J. Lowe, Denton, N. C.	.....	43.75	1.4550	None found	Butter.
5318	Bridgers & Co., Charlotte, N. C.	4.7	48.75	1.4584	Fats other than butter	Oleomargarine.
5551	A. G. Higgins, Belwood, N. C.	.....	44.25	1.4553	None found	Butter.
5623	Bridgers & Co., Charlotte, N. C.	.....	43.75	1.4550	do	Butter, not properly labeled.
6061	W. B. Mann, Raleigh, N. C.	.....	42.97	1.4545	do	Butter.
6062	do	.....	43.25	1.4546	do	Renovated butter.
6063	do	.....	47.95	1.4579	do	Oleomargarine.
6115	Giersch Cafe, Raleigh, N. C.	.....	50.00	1.4593	.....	Oleomargarine.
4463	W. P. White, Pine Bluff	.....	43.75	1.4550	None found	Butter.
4827	W. J. Andrews, Raleigh, N. C.	28.3	43.75	1.4550	do	do.

CANNED FRUIT.

The advantages to be gained by canning and the process of canning fruit are too well known to require explanation here.

RESULTS OF THE EXAMI

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5408	Apples, Compass	D. E. Foot & Co., Baltimore, Md.
5409	Peaches, Champion	H. J. McGrath & Co., Baltimore, Md.
5410	Peaches, Fern	Ferndale Canning Co., Brooklyn, Cal.
5411	Pears, Castle	Woodside Packing Co., Woodside, Del.
5412	Peaches, Perry & Brooks	Schell Packing Co., Baltimore, Md.
5413	Pineapple, White Cap	C. W. Antrim & Son, Richmond, Va.
5414	Peaches, Turtle Dove	Jordan, Trotter & Co., Baltimore, Md.
5423	Peaches, Belle	Marysville Packing Co., Marysville, Cal.
5547	Apricots, Hesperides	Central California Canneries, Sebastopol, Cal.
5549	Cherries, Helmet	California Fruit Canners' Association, Marysville, Cal.
5892	Blackberries, Mountain	R. W. Boyles, Round Peak, N. C.
5893	----do	Foote & Johnson, Yadkinville, N. C.
5894	Apples	R. E. Roberts & Co., Baltimore, Md.
5895	----do	Elkin Canning Co., Elkin, N. C.
5898	Pears, Blue Ridge	Case & Jones, Dana, N. C.
5899	Pineapple	

CANNED VEGETABLES.

The advantages to be gained by canning and the process of canning vegetables, like those of fruit, are well known.

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5876	Tomatoes	Hart & Bassett, Flat Rock, N. C.	Walker Smith, Hendersonville, N. C.
5877	Tomatoes, Standard	H. S. Simmons, Flat Rock, N. C.	----do
5878	----do	J. H. Jones, Saluda, N. C.	E. B. Guice & Co., Saluda, N. C.
5879	----do	Jno. McMurray, Saluda, N. C.	----do
5880	Tomatoes	A. S. Edney, Hendersonville, N. C.	A. L. Table, Hendersonville, N. C.
5881	Tomatoes, Choice	Logan Newman, Fish Top, N. C.	Burckmeyer Bros., Hendersonville, N. C.

Sixteen samples of canned fruit were examined for adulteration, but none was found. One sample of pineapple, No. 5899, was not properly labeled. The label did not show the name and address of the manufacturer.

NATION OF CANNED FRUITS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Adulterants.		Remarks and Conclusions.
		Preservatives.	Objectionable Coloring Matter.	
5408	Hayes & Pool, Durham, N. C.	None found	None found	
5409	do	do	do	
5410	do	do	do	
5411	do	do	do	
5412	J. D. Edwards & Son, Durham, N. C.	do	do	
5413	do	do	do	
5414	I. E. Burnett & Co., Durham, N. C.	do	do	
5423	C. Y. Holding & Co., Wake Forest, N. C.	do	do	
5547	N. Hammond, Laurinburg, N. C.		do	
5549	C. V. Williams, Hamlet, N. C.	None found	do	
5892	R. C. Poore, Mt. Airy, N. C.	do	do	
5893	W. F. Morrison, Concord, N. C.	do	do	
5894	Theo. Atwell, Salisbury, N. C.	do	do	
5895	W. F. Morrison, Concord, N. C.	do	do	
5898	Walker Smith, Hendersonville, N. C.	do	do	
5899	Dave Bost Co., Concord, N. C.	do	do	Not properly labeled.

Twenty-one samples of canned vegetables were examined, and no adulteration was found. One sample of tomatoes, No. 5885, contained a rather large amount of liquid matter, compared with the solid matter present.

OF CANNED VEGETABLES.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5876	None found	None found	
5877	do	do	
5878	do	do	
5879	do	do	
5880	do	do	
5881	do	do	

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5882	Tomatoes, Mountain	R. W. Boyles, Round Peak, N. C.	R. C. Poore, Mt. Airy, N. C.
5883	Tomatoes	D. M. Miller, Salisbury, N. C.	D. M. Miller, Salisbury, N. C.
5884	----do	Foot & Johnson, Yadkinville, N. C.	----do
5885	Tomatoes, Choice	T. J. Shinn, Georgeville, N. C.	D. J. Bost Co., Concord, N. C.
5886	Beans, Mountain	R. W. Boyles, Round Peak, N. C.	R. C. Poore, Mt. Airy, N. C.
5887	Lima Beans, Apple Blossom	Blossom Canning Co., Rome, N. Y.	V. W. Idol & Co., High Point, N. C.
5888	String Beans	A. S. Edney, Hendersonville, N. C.	Walker Smith, Hendersonville, N. C.
5889	String Beans, Catawba Valley	Catawba Valley Canning Co., Morganton, N. C.	Bristol & Harbison, Morganton, N. C.
5890	Corn	Taylor & Boyles, Richmond, Va.	Vernon Grocery Co., Winston, N. C.
5891	Corn, Pride of the Valley	Frederick Packing Co., Frederick City, Md.	----do
5896	Tomatoes and Okra, Standard	Valmost Canning Co., Hendersonville, N. C.	Burckmeyer Bros., Hendersonville, N. C.
5897	Beets	J. W. Wofford, Hendersonville, N. C.	Walker Smith, Hendersonville, N. C.
4683	Peas, canned, Petite Pois	Bennett, Sloan & Co., New York, N. Y.	W. H. Barnes, Goldsboro, N. C.
4765	Pork and Beans, Wagner's	Martin-Wagner Co., Baltimore, Md.	Williams-Little Grocery Co., Wilson, N. C.
4766	Baked Beans, Bunker Hill	Norman & Lange, Baltimore, Md.	Johnson Bros., Greenville, N. C.

VINEGAR.

Acetic acid is, of course, the principal constituent of vinegar, but the latter also contains small amounts of ethyl acetate, aldehydes, alkaline acetates, tartrates and various other salts.

Vinegar, on long standing exposed to the air, deteriorates and loses more or less of its acidity.

The food standards adopted by the Board of Agriculture recognize six kinds of vinegar, namely: (1) vinegar, cider vinegar; (2) wine vinegar; (3) malt vinegar; (4) sugar vinegar; (5) spirit vinegar; (6) glucose vinegar.

When vinegar is sold without naming the class to which it belongs, according

RESULTS OF THE EXAM

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5542	Vinegar, Blue Ribbon, Spirits	American Extract and Vinegar Co., Nashville, Tenn.	A. P. Barrett, Rockingham, N. C.
5443	Vinegar, Star, Pickling	L. C. Younger, Richmond, Va.	J. R. Coley, Rockingham, N. C.
5444	Vinegar, Cider	R. M. Hughes & Co., Louisville, Ky.	H. M. Broom & Co., Monroe, N. C.

OF CANNED VEGETABLES—CONTINUED.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5882	None found	None found	
5883	do	do	
5884	do	do	
5885	do	do	Contained but little solid matter and much liquid.
5886	do	do	
5887	do	do	
5888	do	do	
5889	do	do	
5890	do	do	
5891	do	do	
5896	do	do	
5897	do	do	
4683	do	do	
4765	do	do	
4766	do	do	

to the standards, it means a product made from apple cider. Therefore, when a vinegar is sold under a brand or trade name, it should state the class to which it belongs; otherwise it will be presumed to be an apple-cider vinegar; then, in case it is not a cider vinegar, it will be classed as misbranded and its sale in the State regarded as a violation of the Food Law.

During the year sixty-four samples of vinegar have been examined, ten (or little more than 15.5 per cent) of which proved to be adulterated or misbranded.

To comply with the requirements of the law a vinegar must contain at least 4 per cent acetic acid. Eight of the samples examined and reported in the table below were below standard. Two samples that proved to be compounds were sold for cider vinegar.

INATION OF VINEGAR.

Laboratory Number.	Total Acidity (Acetic Acid)—Per Cent.	Solid Matter in Solution—Per Cent.	Ash—Per Cent.	Sodium Bicarbonate.	Remarks and Conclusions.
5542	3.60	0.27	0.02	No change	Distilled spirit vinegar, below standard.
5443	4.67	0.68	0.19	Slightly darker	Compound vinegar.
5444	4.28	2.19	0.29	Very dark	Apple cider vinegar.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5445	Vinegar	Knadler & Lucas, Louisville, Ky.	S. B. Hartt, Monroe, N. C.
5558	do		G. Knotts & Son, Littleton, N. C.
5569	do	D. J. Gregory Vinegar Co., Richmond, Va.	C. A. Ingram, Mt. Gilead, N. C.
5579	Vinegar, White House	Semmes-Board Co., Washington, D. C.	Thomas White Co., Durham, N. C.
5584	Vinegar		R. J. Shields, Hobgood, N. C.
5615	do	Fleischman Vinegar Works. New York, N. Y.	The Hicks Co., Wilmington, N. C.
5626	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	Uriah Watson, Murfreesboro, N. C.
6004	Vinegar, Apple Cider	Mrs. T. J. Smith, Crocket, Va.	W. L. Pickard, Greensboro, N. C.
6005	Vinegar	Price & Lucas Cider and Vinegar Co., Louisville, Ky.	F. S. Miles, Reidsville, N. C.
6006	Vinegar, Belle of the South	Knadler Pickling, Cider and Vinegar Co., Louisville, Ky.	J. C. Barker, Winston-Salem, N. C.
6007	Vinegar, Red Cross	Red Cross Vinegar Co., St. Louis, Mo.	Jos. A. Pace & Co., Saluda, N. C.
6008	Vinegar	Russell Mfg. Co., Louisville, Ky.	A. Ficker, Hendersonville, N. C.
6009	Vinegar, Royal, Tarragon	Horton-Kato Mfg. Co., Detroit, Mich.	Smathers Cash Grocery, Waynesville N. C.
6010	Vinegar, Crab Apple Cider	Asheville Bottling Works, Asheville, N. C.	S. H. Miller, Asheville, N. C.
6012	Vinegar, Old Homestead, Spirit.	Old Homestead Mfg. Co., Richmond, Va.	W. H. Taylor Co., Wilson, N. C.
6071	Vinegar, Apple Cider	Dewar & Wilder, Raleigh, N. C.	
6074	Vinegar, Monarch	D. J. Gregory Vinegar Co., Richmond, Va.	R. M. Riddick, Gatesville, N. C.
5332	Vinegar, Pure Cider	Louisville Cider and Vinegar Co., Louisville, Ky.	G. T. Powell, Raleigh, N. C.
5333	Vinegar, White House	Semmes-Board Co., Washington, D. C.	Rogers Grocery Co., Raleigh, N. C.
5385	Vinegar, Crab Apple	Asheville Bottling Works, Asheville, N. C.	Asheville Bottling Works, Asheville, N. C.
5394	Vinegar, Albemarle	C. W. Antrim & Sons, Richmond, Va.	C. E. Jourdan, Durham, N.C.
5395	Vinegar, White House	Semmes-Board Co., Washington, D. C.	do
5396	Vinegar, Heinz	H. J. Heinz Co., Pittsburg, Pa.	Perry ,Wood & Co., Durham, N. C.
5397	Vinegar, Golden Rod	E. H. Shelby Vinegar Co., Richmond, Va.	Markham & Co., Durham, N. C.
5398	Vinegar	R. M. Hughes & Co., Louisville, Ky.	J. C. Hewitt, Durham, N. C.
5399	Vinegar, Albemarle	C. W. Antrim & Sons, Richmond, Va.	T. M. Stephens & Co., Durham, N. C.
5400	Vinegar	Burr Mfg. Co., Richmond, Va.	I. A. Burnett & Co., Durham, N. C.
5420	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	R. W. Wilkinson, Wake Forest, N. C.
5421	Vinegar	Baltimore Mfg. Co., Baltimore, Md.	J. W. Hodge, Wake Forest, N. C.
5422	do	D. J. Gregory Vinegar Co., Richmond, Va.	Homer & Edwards, Wake Forest, N. C.
5427	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	J. G. Ball, Raleigh, N. C.
5436	Vinegar, Acme, Spirits	Gathright-Childs Co., Richmond, Va.	Geo. E. Brooks, Pittsboro, N. C.
5437	Vinegar	Philadelphia Vinegar Co., Philadelphia, Pa.	J. T. McNeill, Red Springs, N. C.
5438	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	Crump & Floyd, Lumberton, N. C.
5439	Vinegar	Austin, Nichols & Co., New York, N. Y.	E. H. Ray, Fayetteville, N. C.
5440	Vinegar, Albemarle	C. W. Antrim & Sons, Richmond, Va.	W. T. Buchanan, Sanford, N. C.

TION OF VINEGAR—CONTINUED.

Laboratory Number.	Total Acidity (Acetic Acid)—Per Cent.	Solid Matter in Solution—Per Cent.	Ash—Per Cent.	Sodium Bicarbonate.	Remarks and Conclusions.
5445	3.84	0.28	0.04	No change	Distilled spirit vinegar, below standard.
5558	3.54	2.65	0.04	Dark	Vinegar.
5569	3.64	1.32		do	Compound vinegar, below standard.
5579	4.18	2.12	0.23	Very dark	Apple cider vinegar.
5584	4.57	2.12	0.35	do	do.
5615	9.44			No change	Distilled spirit vinegar.
5626	4.57	2.21	0.21	Very dark	Apple cider vinegar.
6004	4.33	1.59	0.30	do	do.
6005	4.81	1.08	0.15	Dark	Compound vinegar.
6006	3.51	2.03	0.16	do	Compound vinegar, below standard.
6007	4.07	0.25	0.03	No change	Distilled spirit vinegar.
6008	4.69	1.60	0.21	Very dark	Apple cider vinegar.
6009	5.87	1.67	0.08	No change	Compound vinegar, Tarragon flavor.
6010	4.93	1.76	0.03	do	Compound vinegar, misbranded.
6012	3.48	0.15	0.02	do	Distilled spirit vinegar, below standard.
6071	4.86	3.13	0.47	Very dark	Apple cider vinegar.
6074	4.94	2.32	0.34	do	do.
5332	4.31	2.18	0.30	Very dark	do.
5333	4.39	1.82	0.28	do	do.
5385	4.86	2.44	0.01	No change	Compound vinegar.
5394	4.52	3.03	0.29	Very dark	Apple cider vinegar.
5395	4.22	1.81	0.30	do	do.
5396	4.70	2.67	0.22	do	do.
5397	4.47	2.83	0.38	do	do.
5398	4.17	1.53	0.21	do	do.
5399	4.58	3.13	0.30	do	do.
5400	4.13	0.28	0.01		Distilled spirit vinegar.
5420	4.83	1.64	0.31	Very dark	Apple cider vinegar.
5421	4.93	0.65	0.12	Slightly darker	Vinegar.
5422	3.74	0.71	0.04	do	Compound vinegar, below standard.
5427	4.20	3.94	0.23	Very dark	Apple cider vinegar.
5436	5.30	0.20	0.02	No change	Distilled spirit vinegar.
5437	4.86	1.89	0.36	Very dark	Apple cider vinegar.
5438	4.88	3.62	0.32	do	do.
5439	5.45	2.02	0.24	do	do.
5440	4.67	3.00	0.29	do	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5441	Vinegar, Hughes' Apple Cider	R. M. Hughes & Co., Louisville, Ky.	E. N. Covington, Rockingham, N. C.
5293	Vinegar, Monogram Blend	R. M. Hughes & Co., Louisville, Ky.	C. W. Jones & Bro., Raleigh, N. C.
5294	Vinegar		Jones & Park, Raleigh, N. C.
5295	Vinegar, Monogram Blend	R. M. Hughes & Co., Louisville, Ky.	E. H. King, Raleigh, N. C.
5296	Vinegar		G. W. Goodwin, Raleigh, N. C.
5297	Vinegar, Apple Cider	Lewis Elmer & Sons, Baltimore, Md.	J. J. Wilson, Raleigh, N. C.
5298	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	C. W. White, Raleigh, N. C.
5299	do	do	Oakwood Avenue Grocery, Raleigh, N. C.
5300	Vinegar, Apple Cider	H. J. Heinz Co., Pittsburg, Pa.	Barnes Grocery Co., Raleigh, N. C.
5301	Vinegar, Purity, Apple Cider	Donaldson, Shutz & Co., Baltimore, Md.	Matthews & Taylor, Raleigh, N. C.
5302	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	E. N. Pool, Raleigh, N. C.
5303	Vinegar, White House, Apple Cider.	Semmes-Board Co., Washington, D. C.	J. A. Spencer, Raleigh, N. C.
5304	Vinegar, Apple Cider		Thomas Burns, Raleigh, N. C.
5305	Vinegar, Blue Grass Belle	Jones Bros. & Co., Louisville, Ky.	M. Wortham, Raleigh, N. C.
5306	Vinegar, Elko, Cider	O. L. Gregory Vinegar Co., Paducah, Ky.	Dock Haywood, Raleigh, N. C.
5307	Vinegar, Cider	Raleigh Flour and Feed Co., Raleigh, N. C.	Central Mercantile Co., Raleigh, N. C.
5308	Vinegar, Elko, Cider	O. L. Gregory Vinegar Co., Paducah, Ky.	Jos. Baker, Raleigh, N. C.
5310	Vinegar, Cider		L. A. Fort, Raleigh, N. C.
5317	do	R. M. Hughes & Co., Louisville, Ky.	C. C. Jones, Raleigh, N. C.
5330	Vinegar	J. G. Ball, Raleigh, N. C.	Theus Smith Grocery Co., Raleigh, N. C.
5331	Vinegar, Monogram Blend	R. M. Hughes & Co., Louisville, Ky.	Julius Heller, Raleigh, N. C.
5230	Vinegar, Cider	Hirsch Bros. & Co., Louisville, Ky.	G. S. Terrell, Raleigh, N. C.
5280	Vinegar, White House	Semmes-Board Co., Washington, D. C.	A. Blanton Grocery Co., Shelby, N. C.
5281	do	do	McLean Co., Greensboro, N.C.
6011	Vinegar	Louisville Vinegar and Cider Co., Louisville, Ky.	

CATSUPS AND SAUCES.

There is to be found on the market quite a variety of catsups and sauces, viz., Walnut, Celery, Mushroom, Chili, Tomato and others, but the tomato catsup is by far the most popular of all the bottled catsups and sauces.

In past years most of the tomato catsups were artificially colored with bright-colored coal-tar dyes and preserved with chemical preservatives. As sauces on tables are liable to stand open for some time before being used, there is possibly some excuse for the use of the preservative, but absolutely none for

TION OF VINEGAR—CONTINUED.

Laboratory Number.	Total Acidity (Acetic Acid)—Per Cent.	Solid Matter in Solution—Per Cent.	Ash—Per Cent.	Sodium Bicarbonate.	Remarks and Conclusions.
5441	4.03	2.03	0.31	Very dark	Apple cider vinegar.
5293	4.76	0.46	0.09	Slightly darker	Compound vinegar.
5294	4.15	2.88	0.32	Very dark	Apple cider vinegar.
5295	4.11	1.85	0.10	Dark	Compound vinegar.
5296	4.59	3.16	0.39	Very dark	Apple cider vinegar.
5297	4.69	2.37	0.33	----do	do.
5298	4.57	2.07	0.17	Dark	Vinegar.
5299	4.34	2.02	0.19	----do	do.
5300	4.39	1.61	0.35	Very dark	Apple cider.
5301	3.57	2.14	0.24	----do	Apple cider, below standard.
5302	4.07	2.35	0.31	Dark	Vinegar.
5303	5.84	2.44	0.31	Very dark	Apple cider vinegar.
5304	5.05	2.55	0.31	----do	do.
5305	4.55	1.98	0.17	Dark	Vinegar.
5306	4.56	2.62	0.37	Very dark	Apple cider vinegar.
5307	5.06	3.06	0.77	----do	do.
5308	4.90	2.69	0.38	----do	do.
5310	3.68	4.10	0.42	Very dark	Apple cider vinegar, below standard.
5317	4.45	1.54	0.08	Dark	Compound vinegar.
5330	4.45	2.05	0.12	Slightly darker	Malt or cereal vinegar.
5331	4.40	1.66	0.07	Dark	Compound vinegar.
5230	4.40	2.56	0.31	Very dark	Apple cider vinegar.
5280	4.67	2.13	------	----do	do.
5281	4.70	------	------	----do	do.
6011	4.28	2.04	0.33	Dark	Vinegar.

the coal-tar dye. Since food officials have condemned the use of preservatives and coal-tar dyes so severely, their use is being discontinued. However, as catsups and sauces are condiments and not foods to be eaten in large quantities, the State Food Law provides that they may, if the fact is stated on the label, contain not to exceed 0.2 per cent of benzoic acid. While this amount is provided for by the law, we are now firmly convinced that, if tomato catsup is properly made from the best materials, no preservative is necessary to keep the catsup in good condition.

During the past summer a test of its keeping qualities was made on a sample of catsup that contained no chemical preservative. The sample was opened in May and a part of the catsup removed. At various times during the months of June, July and August the sample was reopened, shaken up and more of it removed. On September 15th, after most of the contents of the bottle had been removed, the catsup that remained was perfectly sweet and good; in fact, it did not spoil at all.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5867	Catsup, Snider's	T. A. Snider Preserve Co., Cincinnati, Ohio
5868	Catsup, Hyman's	Hyman Pickle Co., Louisville, Ky.
5869	Catsup, Admiral	Knadler & Lucas, Louisville, Ky.
----	Catsup, Heinz	H. J. Heinz Co., Pittsburg, Pa.

TABLE AND COOKING OILS.

Olive oil is the oil obtained from the sound, matured fruit of the cultivated olive tree. It is highly prized as a table oil. Before the agitation of food adulteration became so general, olive oil was much adulterated with other oils, but of late much less adulteration is found in it.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5288	Olive Oil, Livola	Livola Olive Oil Co., Rochester, N. Y.
5992	Olive Oil, Monarch	Reid-Murdoch Co., Chicago, Ill.
5242	Cooking Oil, Wesson	Wesson Co., Savannah, Ga.
4462	Olive Oil, Lucca	
4545	Olive Oil, Hule D'Olive	Eugene DuRaix, Lucca, Italy
4622	----do	----do

It seems that if a sample of catsup can be kept under those circumstances, it would be safe to say that a chemical preservative is not necessary in tomato catsup.

Four samples of catsup were examined. Three samples contained benzoates, one contained no preservative and one was adulterated with coal-tar dye.

TION OF CATSUPS AND SAUCES.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Preservatives.	Adulterants.
5867	Acme Grocery Co., Reidsville	Benzoic acid	None found.
5868	Acme Grocery Co., Reidsville	do	do.
5869	J. L. Seacrest, High Point	do	Coal-tar dye.
----	----------	None found	None found.

Cooking oils are usually highly refined cotton-seed oils, and are not much adulterated. Some of the cooking oils are very desirable for such purposes.

Six samples of oil were examined. They were as represented, and no adulteration was found.

TION OF TABLE AND COOKING OILS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Specific Gravity 15.5° c.	Reading Refractometer 15.5° c.	Refractive Index 15.5° c.	Adulterants.
5288	J. H. Posey, Asheville, N. C.	0.91618	67.07	1.4704	None found.
5992	Dave Bost Co., Concord, N. C.	0.91593	67.27	1.4706	do.
5242	Mrs. Sterling Price, Raleigh, N. C.	--------	--------	--------	do.
4462	W. P. White, Pine Bluff, N. C.	0.91550	68.00	1.4710	do.
4545	Stronach Sons' Co., Raleigh, N. C.	0.91645	68.00	1.4710	do.
4622	do	0.91638	68.00	1.4710	do.

BAKING POWDERS.

There are three classes of baking powders in general use. They are tartrate powders, phosphate powders, and alum powders. The acid present in the first is tartaric acid, the acid present in the second is phosphoric acid, and the acid in the third or alum powder is sulphuric acid.

The value of a baking powder, so far as its leavening power is concerned, depends largely upon the amount of available carbon dioxide present. If properly made and used anything like fresh, any or all of them serve well the purpose for which they are intended, and it is only the residue left in the

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5824	Baking Powder, Cascade	American Pure Food Co., St. Louis, Mo.
5825	Baking Powder, Victory	E. C. Hazzard & Co., New York City
5826	Baking Powder, Cream	Price Baking Powder Co., New York City
5827	Baking Powder, Quaker	E. M. Bergey Co., Chicago, Ill.
5828	Baking Powder, Rough Rider	Southern Manufacturing Co., Richmond, Va.
5829	Baking Powder, Watermelon	Sea Gull Specialty Co., Baltimore, Md.
5538	Baking Powder, Carolina	H. R. Horne & Sons, Fayetteville, N. C.

bread after baking that makes one class of powders more desirable than the others. Then the most choice class of powders is the powder whose residue left in the bread is the least injurious to health.

Seven samples of powders were examined and no adulteration was found. However, sample No. 5825 was very low in available carbon dioxide gas, which may have been partially due to age; but the results show that it was at least partially due to bad mixing. No. 5824 and No. 5825 were not properly labeled. The label did not show the acid ingredient present, as is required by the rules on labeling.

TION OF BAKING POWDERS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Carbon Dioxide.			Ash, Insoluble in H Cl. Per Cent.	Class.	Filler.	Remarks and Conclusions.
		Available Per Cent.	Residual Per Cent.	Total Per Cent.				
5824	O. F. Pearce, Greensboro, N. C.	9.65	1.60	11.25	0.59	Alum	Starch	Not properly labeled.
5825	Yates & McGuire, Asheville, N. C.	5.95	3.25	9.20	0.52	Alum Tartrate Phosphate	do	do.
5826	W. P. McLain, Statesville, N. C.	9.45	1.42	10.87	0.16	Tartrate	do	
5827	McKee & Son, Lincolnton, N. C.	12.27	2.35	14.62	0.53	Alum	do	
5828	J. W. Isler, Goldsboro, N. C.	12.20	4.65	16.85	0.65	do	do	
5829	Kinston Peanut Co., Kinston, N. C.	14.55	2.52	17.12	0.40	do	do	
5538	M. A. Bethune, Fayetteville, N. C.	11.55	3.60	15.15	0.29	Tartrate	do	

RICE.

The examination of fifty-nine samples of rice, obtained by an inspector of the Department from various towns of the State, revealed the fact that they were all coated or polished with glucose and talc.

It is claimed by the manufacturers or millers that rice is coated for two reasons, as follows:

1. The coating makes the rice less susceptible to dust and other foreign matters during transportation and storage.

2. It is in a measure a preventive against the attack of weevils and worms, which are so destructive in warm climates.

The advantage gained by polishing rice, so far as rendering it less susceptible to dust, etc., would hardly, it seems, justify the polishing. The polishing of the rice to protect it from weevils, worms, etc., is more reasonable, and

RESULTS OF THE EX

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5348	Rice	D. L. Gore & Co., Wilmington, N. C.
5349	----do	Melcher & Co., Charleston, S. C.
5350	----do	D. L. Gore & Co., Wilmington, N. C.
5351	----do	----do
5352	----do	Steadman & Sons, Charleston, S. C.
5353	----do	Melcher & Co., Charleston, S. C.
5354	Rice, Cracked Grain	Marsh Grocery Co., Raleigh, N. C.
5355	Rice, Whole Grain	----do
5356	Rice	
5357	----do	Dewar & Wilder, Raleigh, N. C.
5358	Rice, Imperial	Carolina Rice Mills, Goldsboro, N. C.
5359	Rice	Githens, Rexsamer & Co., Philadelphia, Pa.
5360	----do	Dewar & Wilder, Raleigh, N. C.
5361	----do	Bloom & Son, New Orleans, La.
5362	----do	Carolina Rice Mills, Goldsboro, N. C.
5363	Rice, Head Rice, first quality	----do
5364	Rice, Head Rice, second quality	----do
5365	Rice, Cracked	
5366	Rice, Fancy Head	Jos. G. Gill Co., Norfolk, Va.
5367	----do	New Orleans Coffee Co., New Orleans, La.
5368	Rice	
5369	Rice, Carolina Head	Carolina Rice Mills, Goldsboro, N. C.
5370	Rice	Dunn Bros., Raleigh, N. C.
5371	----do	
5372	----do	Dunn Bros., Raleigh, N. C.

possibly makes it justifiable. However, as the appearance of the rice is so much improved by the polishing, it would appear that the improvement of the appearance of it is the real reason for the polishing.

Under the fifth provision of Foods, section 7 of the National Food Law, and under regulation 14 of the United States Department of Agriculture, the use of talc as a preservative in food in interstate commerce is permitted, provided that each package be plainly labeled with the name of the preservative and the proper directions for its removal. As the polishing improves the appearance of the rice without improving its quality, under the State Food Law it could probably be prohibited; but if it protects the rice from the attacks of weevils, worms, etc., it might not be advisable to do so.

If rice is coated with glucose and talc, the label of the package must bear the following statement: "Coated with glucose and talc. Remove by washing."

AMINATION OF RICES.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Remarks and Conclusions.
5348	Standard Store Co., Aberdeen, N. C.	Coated with glucose and talc and the fact was not made known to purchaser.
5349	F. C. Allen, Wadesboro, N. C.	do.
5350	J. A. McRae, Wadesboro, N. C.	do.
5351	----do	do.
5352	D. E. Gaitwood, Wadesboro, N. C.	do.
5353	J. T. McNeill & Co., Red Springs, N. C.	do.
5354	Julius Heller, Raleigh, N. C.	do.
5355	----do	do.
5356	G. T. Powell, Raleigh, N. C.	do.
5357	Rudy & Buffaloe, Raleigh, N. C.	do.
5358	Rogers Grocery Co., Raleigh, N. C.	do.
5359	----do	do.
5360	A. S. Womble, Raleigh, N. C.	do.
5361	D. T. Johnson & Son, Raleigh, N. C.	do.
5362	----do	do.
5363	W. B. Mann, Raleigh, N. C.	do.
5364	----do	do.
5365	----do	do.
5366	J. B. Green & Co., Raleigh, N. C.	do.
5367	M. Rosenthal & Co., Raleigh, N. C.	do.
5368	Smith-Forest Co., Raleigh, N. C.	do.
5369	J. R. Ferrall & Co., Raleigh, N. C.	do.
5370	C. W. Jones & Bro., Raleigh, N. C.	do.
5371	Jones & Park, Raleigh, N. C.	do.
5372	B. H. King, Raleigh, N. C.	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5373	Rice	Marsh & Co., Raleigh, N. C.
5374	----do	Peebles Bros., Raleigh, N. C.
5375	----do	
5376	----do	Dunn Bros., Raleigh, N. C.
5401	Rice, Premier	Francis H. Leggett & Co., New York
5402	Rice	Allen-Owen Co., Durham, N. C.
5509	Rice, Cracked	W. D. Porcher, Charleston, S. C.
5510	Rice, second quality	----do
5511	Rice, first quality	----do
5512	Rice	Melcher & Co., Charleston, S. C.
5513	----do	New Orleans Coffee Co., New Orleans, La.
5514	----do	Otto Tiedeman & Sons, Charleston, S. C.
5417	----do	
5418	----do	
5419	----do	Langhoff Bros., New Orleans, La.
5620	Rice, first quality	Carolina Rice Mills, Goldsboro, N. C.
5621	Rice, second quality	----do
5755	Rice	F. W. Wagner & Co., Charleston, S. C.
5756	----do	
5757	----do	Hendersonville Grocery Co., Hendersonville, N. C.
5758	----do	F. W. Wagner & Co., Charleston, S. C.
5759	----do	Carolina Rice Co., Charleston, S. C.
5760	----do	F. W. Wagner & Co., Charleston, S. C.
5761	----do	Githens, Rexsamer & Co., Philadelphia, Pa.
5762	----do	F. W. Wagner & Co., Charleston, S. C.
5763	----do	Otto Tiedeman & Sons, Charleston, S. C.
5764	----do	Van Talmage 2nd, Charleston, S. C.
5765	----do	Otto Tiedeman & Sons, Charleston, S. C.
5766	----do	----do
5767	----do	Bayou City Rice Mills, Houston, Tex.
5769	----do	Otto Tiedeman & Sons, Charleston, S. C.
5770	----do	F. W. Wagner & Co., Charleston, S. C.
5771	Rice, Carolina Head	Carolina Rice Mills, Goldsboro, N. C.
5768	Rice	----do

TION OF RICES—CONTINUED.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Remarks and Conclusions.
5373	C. S. Parker, West Raleigh, N. C.	Coated with glucose and talc and the fact was not made known to the purchaser.
5374	L. J. Williams & Co., Raleigh, N. C.	do.
5375	----do----	do.
5376	Hobby & Overby, West Raleigh, N. C.	do.
5401	C. E. Jourdan, Durham, N. C.	do.
5402	Perrywood & Co., Durham, N. C.	do.
5509	G. E. Brooks, Pittsboro, N. C.	do.
5510	----do----	do.
5511	----do----	do.
5512	E. W. Covington, Rockingham, N. C.	do.
5513	A. P. Barrette, Rockingham, N. C.	do.
5514	C. G. Porter, Rockingham, N. C.	do.
5417	R. W. Wilkinson, Wake Forest, N. C.	do.
5418	J. W. Hodge, Wake Forest, N. C.	do.
5419	Wake Forest Supply Co., Wake Forest, N. C.	do.
5620	J. F. Tayloe, Washington, N. C.	do.
5621	----do----	do.
5755	Griffin & Parham, Gastonia, N. C.	do.
5756	D. M. Wells, Hendersonville, N. C.	do.
5757	----do----	do.
5758	A. Ficker, Hendersonville, N. C.	do.
5759	----do----	do.
5760	Mitchell & Cox, Brevard, N. C.	do.
5761	Walter Smith, Hendersonville, N. C.	do.
5762	----do----	do.
5763	M. Hyams, Asheville, N. C.	do.
5764	Bristol & Harbison, Morganton, N. C.	do.
5765	A. F. Summers & Co., Morganton, N. C.	do.
5766	----do----	do.
5767	W. A. Ross, Morganton, N. C.	do.
5769	J. D. Lee, Wilson, N. C.	Not properly labeled; coated with glucose and talc and not so labeled.
5770	Ruffin-High Co., Wilson, N. C.	do.
5771	Cash Grocery Store, Wilson, N. C.	do.
5768	Hadley, Harris & Co., Wilson, N. C.	Coated with glucose and talc and the fact was not made known to the purchaser.

PRESERVES AND MARMALADES.

As the subject of preserves and marmalades has been discussed in previous reports, it is only necessary to state here that all products under this head containing ingredients other than fruit and cane sugar syrup, with or without spices, should be labeled "Imitation" or "Compound," or they will be regarded as adulterated.

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5403	Marmalade, Hartley's	W. P. Hartley, London, Eng.	Patterson Bros., Durham, N. C.
5405	Marmalade, Premier, Orange	Francis H. Leggett & Co., New York.	Perrywood & Co., Durham, N. C.
5406	Preserves, Taylor's Compound	Taylor's Preserving Co., Boston, Mass.	Markham-Stephens Co., Durham, N. C.
5424	Preserves, Empire, Strawberry.	Winters & Profit Canning Co., New York.	C. Y. Holden & Co., Wake Forest, N. C.
5541	Preserves, Glucose	E. G. Daily Co., Detroit, Mich.	J. R. Coley, Rockingham, N. C.
5542	Preserves, Peach	Emery Food Co., Chicago, Ill.	Hardison Co., Wadesboro, N. C.
5543	Preserves, Fruit	Thomas Preserving Co., New York.	L A. Monroe & Son, Laurinburg, N. C.

JAMS.

Jams, like preserves and marmalades, having been discussed in previous reports, it is only necessary to say here that products under this head containing ingredients other than fruit specified and cane-sugar syrup, with or without

RESULTS OF THE EX

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5404	Jam, Genesee	Sprague, Warner & Co., Chicago, Ill.
5334	Jam, Red Raspberry	P. J. Ritter Conserve Co., Philadelphia, Pa.
5998	Jam, Pure Fruit	Reid, Murdock & Co., Chicago, Ill.

Only seven samples were examined under this head, and no adulteration was found. However, the samples were tested for chemical preservatives and dyes only. One sample of preserves, No. 5543, was artificially colored, but the dye was a harmless vegetable color, and its presence was stated on the label.

OF PRESERVES AND MARMALADES.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5403	None found	None found	
5405	do	do	
5406	do	do	
5424	do	do	
5541	do	do	
5542	do	do	
5543	do		Artificially colored, vegetable dye.

spices, should be labeled "Imitation" or "Compound," or they will be regarded as adulterated.

Three samples of jams were examined, and no adulteration was found.

AMINATION OF JAMS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Adulterants.	
		Preservatives.	Coloring Matter.
5404	Patterson Bros., Durham, N. C.	None found	None found.
5334	G. S. Terrell, Raleigh, N. C.	do	do.
5998	Dave Bost Co., Concord, N. C.	do	do.

JELLY.

Fruit jelly is a clear, gelatinous product, made entirely from the fruit specified and cane sugar, with or without spices. Fruit jelly containing ingredients other than those named above should be labeled "Imitation" or "Compound"; otherwise they will be regarded as adulterated.

RESULTS OF THE EX

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5335	Jelly, Schimmel's	American Preserve Co., Philadelphia, Pa.
5336	Jelly, Peerless	S. J. Van Lill Co., Baltimore, Md.
5407	Jelly, Glucose, Apple	E. G. Daily Co., Detroit, Mich.
5425	Jelly, Michigan, Compound	----do
5426	Jelly, Bull Head, Apple	Gibbs Preserving Co., Baltimore, Md.
5545	Jelly	Mrs. W. L. Covington, Rockingham, N. C.
5544	Jelly, Pomona, Apple	P. J. Ritter & Co., Philadelphia, Pa.
5546	Jelly, Old Orchard	Kidwell Bros. Co., Baltimore, Md.
5548	Jelly, Glucose, Apple	E. G. Daily Co., Detroit, Mich.
5995	Jelly, Pure Fruit	Reid, Murdock & Co., Chicago, Ill.
5996	Jelly, Apple	Merchant Bros., Dana, N. C.
5997	Jelly, Highland, Glucose	Gibbs Preserving Co., Baltimore, Md.

CONFECTIONERY.

Confectionery is a term applied to a wide range of products, which may be described as preparations of saccharine substances with color and flavor added. Candy is a term that is applied to a large part of confectionery.

The saccharine materials which are employed in the manufacture of confectionery are sugars of various kinds—namely, maple, cane, and beet sugar, together with glucose, dextrose, and invert sugar. Starch is largely used as a filler in some forms of confectionery.

Various colors, such as saffron, annatto, cochineal and aniline dyes, are used in confectionery. The flavors employed in confectionery are either natural flavors, derived from nuts, fruits or flowers, or synthetic preparations resembling, to a greater or less degree, the natural flavor of fruit, nuts or flowers. Chocolate is one of the most common and one of the most highly prized flavoring reagents employed in confectionery.

Jelly, being made from the juice of fruit, is much easier to adulterate without being detected than preserves or jams.

These samples, twelve in number, were examined for chemical preservatives and coal-tar dyes, with negative results. For lack of time, these samples were not examined for other adulterants that may have been present.

AMINATION OF JELLIES.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Adulterants.	
		Preservatives.	Coloring Matter.
5335	G. T. Powell, Raleigh, N. C.	None found	None found.
5336	Hobby & Overby, West Raleigh, N. C.	do	do.
5407	I. A. Burnett & Co., Durham, N. C.	do	do.
5425	Homer & Edwards, Wake Forest, N. C.	do	do.
5426	do	do	do.
5545	Palmer, Diggs & Co., Rockingham, N. C.	do	do.
5544	do	do	do.
5546	James Plunket, Wadesboro, N. C.	do	do.
5548	J. R. Coley & Son, Rockingham, N. C.	do	do.
5995	Dave Bost Co., Concord, N. C.	do	do.
5996	Walker Smith, Hendersonville, N. C.	do	do.
5997	M. P. Gallop Co., Elizabeth City, N. C.	do	do.

Each manufacturer has his own methods of mixing, flavoring and coloring his products, and these are mostly trade secrets.

To know just what constitutes adulteration of confectionery is rather difficult. The Food Law says that it must not contain terra alba, barytes, talc, chrome yellow, or other mineral substance. That sounds simple, but that is not all it says. It must not contain poisonous color or flavor, or other ingredients deleterious to health. The question, however, of what is deleterious to health is one that is difficult to answer. The manufacturer of coloring and flavoring materials and the manufacturer of confectionery are always quite ready to certify that the colors and flavors used are harmless to health.

Under the head of confectionery, forty-seven samples were examined, and, while many of them contained glucose, starch and coal-tar dyes, none contained any substance that could with certainty be regarded as an adulterant.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5337	Candy, Crescent Creams	R. B. Horne & Co., Winston-Salem, N. C.	Theus Smith Grocery Co., Raleigh, N. C.
5338	Candy, Pure Cocoanut	New England Confectionery Co., Boston, Mass.	Rudy & Buffaloe, Raleigh, N. C.
5339	Candy, Twin City Sugar Sticks.	R. B. Horne & Co., Winston-Salem, N. C.	do
5340	Candy, Mixed	Porter Candy Co., Raleigh, N. C.	D. T. Johnson & Son, Raleigh, N. C.
5341	Candy, Premium Chocolate Drops.	Hawley & Hoofs, New York, N. Y.	do
5342	Candy, Red and White	Porter Candy Co., Raleigh, N. C.	do
5343	Candy, Oriental Eggs	do	Jones & Park, Raleigh, N. C.
5344	Candy, Eggs	do	do
5345	Candy, C. A. S. H.	The Hopkins Co., Manassas, Va.	B. H. King, Raleigh, N. C.
5346	Candy, Barber's Pole		do
5347	Candy		C. S. Parker, West Raleigh, N. C.
5521	Candy, Red Balls	Heath-Morrow Co., Monroe, N. C.	H. M. Broom & Co., Monroe, N. C.
5522	Candy, Blocks	Littlefield, Stern & Saunders, Knoxville, Tenn.	do
5523	Candy, Sticks	H. L. Sleschnor, Atlanta, Ga.	do
5524	do	do	do
5525	Candy	Chase & Co., Boston, Mass.	do
5526	Candy, Fancy	Croft & Allen, Philadelphia, Pa.	do
5527	Candy	Heath-Morrow Co., Monroe, N. C.	Helms, Richmond & Co., Monroe, N. C.
5528	Candy, Chocolate Drops	Fleming & Christian Co., Richmond, Va.	J. D. Parker, Monroe, N. C.
5529	Candy, Fancy	do	do
5536	Candy, Chocolate	Brades & Ghuns, Louisville, Ky.	H. M. Broom & Co., Monroe, N. C.
5530	Candy, Fancy	Fleming & Christian Co., Richmond, Va.	J. D. Parker, Monroe, N. C.
5531	Candy, Toyland Creams	The Plows Candy Co., St. Louis, Mo.	do
5532	Candy	Kemker-Woolwine Candy Co., Nashville, Tenn.	M. Waller, Monroe, N. C.
5533	do	do	do
5534	Candy, Chocolate Creams,	Fleming & Christian Co., Richmond, Va.	do
5535	Candy, Chocolate	Stern & Co.	H. M. Broom & Co., Monroe, N. C.
5536	Candy, Chocolate Drops	Brades & Ghuns, Louisville, Ky.	do
5831	Candy, Cup Strawberries		Ideal Candy Store, Greensboro, N. C.
5832	Candy, Necco Lollipops	New England Confectionery Co., Boston, Mass.	do
5833	Candy	Olympia Candy Works, Concord, N. C.	
5834	Candy, Cocoanut	do	
5835	Candy, White Taffy	do	
5836	Candy, Pink Taffy	do	
5837	Candy, Cocoanut	do	
5838	Candy, Peanut	do	
5839	Candy, Cocoanut	do	

TION OF CONFECTIONERY.

Laboratory Number.	Ash—Per Cent.	Filler.	Coloring.	Glucose.	Adulterants.
5337	0.08			Glucose	None found.
5338	0.23			do	do.
5339	0.01				do.
5340	0.15			Glucose	do.
5341	0.22			do	do.
5342	0.50			do	do.
5343	0.17			do	do.
5344	0.24			do	do.
5345	0.15			do	do.
5346	0.21			do	do.
5347	0.12			do	do.
5521	0.09		Coal-tar dye		do.
5522	0.33		do		do.
5523	0.12	Starch	do		do.
5524	0.005	do	do		do.
5525		do			do.
5526	0.09	do			do.
5527	0.08	do	Coal-tar dye		do.
5528	0.48				do.
5529	0.24	Starch	Coal-tar dye		do.
5536	0.69				do.
5530	0.23	Starch	Coal-tar dye		do.
5531	0.26				do.
5532	0.22	Starch	Coal-tar dye		do.
5533	0.10		do		do.
5534	0.25				do.
5535					do.
5536					do.
5831	0.46		Coal-tar dye		do.
5832	0.27		do		do.
5833	0.28		do		do.
5834	0.30				do.
5835	0.17				do.
5836	0.12		Coal-tar dye		do.
5837	0.30				do.
5838	0.51				do.
5839	0.54		Coal-tar dye		do.

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5840	Candy, Peanut	Olympia Candy Works, Concord, N. C.	
5841	Candy, Peach and Honey Kisses.	C. W. Antrim & Son, Richmond, Va.	Baker, Bizzell & Edgerton, Goldsboro, N. C.
5842	Candy, Monarch Mixture.	Gibbs Candy Co., Baltimore, Md.	do
5843	Candy, Newport Mixture	do	do
5844	Candy, American Ices	do	do

MARASCHINO AND CREME DE MENTHE CHERRIES.

Cherries on the market sold as Maraschino and Creme de Menthe, instead of being preserved in Maraschino brandy, etc., are generally preserved with sulphurous acid or benzoic acid. The natural color of the fruit, which is

RESULTS OF THE EXAMINATION OF CHERRIES—

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5537	Cherries, Maraschino Belle.		Garrett & McNeill, Red Springs, N. C.
5951	do	Dandicolle & Gaudin, Bordeaux, France.	A. P. Grizzard, Winston, N. C.
5952	Cherries, Maraschino, Cal. Royal Ann.	Long Syrup Refining Co., San Francisco, Cal.	Shell Grocery Co., Statesville, N. C.
5953	Cherries, Creme de Menthe.	The Mihalovitch-Fletcher Co., Cincinnati, O.	Whitener & Martin, Hickory, N. C.

CORN MEAL.

BY C. D. HARRIS.

Considering the nutrition it carries and the market price, corn meal is by far the cheapest food offered to man over a large part of the civilized world.

OF CONFECTIONERY—CONTINUED.

Laboratory Number.	Ash—Per Cent.	Filler.	Coloring.	Glucose.	Adulterants.
5840	1.32				None found.
5841	0.88				do.
5842	0.28				do.
5843	0.13				do.
5844	0.38				do.

destroyed by the sulphurous acid, is replaced by coal-tar dyes, which are not affected by the acid.

Four samples of cherries (three Maraschino and one Creme de Menthe) were examined. All the samples were found to contain benzoates and two contained coal-tar dyes.

MARASCHINO, CREME DE MENTHE, ETC.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5537	Benzoic acid		Not properly labeled.
5951	do	Coal-tar dye	
5952	do	do	
5953	do		

That it has not been more generally used can be explained only in part. In the first place, corn meal cannot be made into a light, porous loaf, as can flour from the wheat grain. Again, when reduced to meal on grinding, the oil of the grain soon becomes rancid and the meal loses its palatability.

Twenty samples of meal were analyzed. The per cent of ash and the microscopic examination showed all the samples to be pure corn meal.

Results of the examination of corn meal follow in the table:

RESULTS OF THE EXAMI

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5631	Corn Meal, Bon Ton	Asheville Milling Co., Asheville, N. C.
5632	Corn Meal	T. M. Rymer, Asheville, N. C.
5633	----do	Weaverville Milling Co., Weaverville, N. C.
5634	Corn Meal, Bon Ton	Asheville Milling Co., Asheville, N. C.
5635	Corn Meal	Hazel Green Mills, Asheville, N. C.
5636	----do	Weaverville Milling Co., Weaverville, N. C.
5637	----do	Hickory Milling Co., Hickory, N. C.
5638	----do	Glen Alpine Milling Co., Glen Alpine, N. C.
5639	----do	Lenoir Mills, Lenoir, N. C.
5640	----do	Home Milling Co., Lenoir, N. C.
5641	----do	----do
5642	----do	Lenoir Mills, Lenoir, N. C.
5643	----do	H. F. Munt, Petersburg, Va.
5644	----do	Mayo Milling Co., Richmond, Va.
5645	----do	B. D. Booth, Petersburg, Va.
5646	----do	Warner Moore & Co., Richmond, Va.
5647	Corn Meal, Sawyer's Dinner Party	Eiglehart, Evansville, Ind.
5719	Corn Meal	Mayo Milling Co., Richmond, Va.
5720	----do	R. G. Thompson, Petersburg, Va.
5721	----do	H. F. Munt, Petersburg, Va.

EXAMINATION OF FLOUR.

BY C. D. HARRIS.

As is well known, flour is the interior portion of grain, usually wheat, finely ground and separated from the outer husks or bran by bolting. It is composed chiefly of two classes of substance—carbohydrates (mainly starch and sugar) and nitrogenous compounds. The former of these are heat and force producers in the body, while the latter go to the making of muscle and tissues. What are known as the finer grades and higher-priced flours are usually not the most nutritious. When the germ or wheat heart, which is rich in nitrogenous compounds, but not so white as the starchy matter, is removed, it is at the expense of the nutritive value of the flour, for it is naturally rich in the carbohydrates anyway.

NATION OF CORN MEAL.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Date of Purchase.	Ash—Per Cent.	Microscopic Examination.	Adulterants.
5631	Noland-Rowland Co., Asheville, N. C.	8-10-08	1.03	Corn product	None found.
5632	Stradley & Luther, Asheville, N. C.	8-10-08	1.15	do	do.
5633	do	8-10-08	1.10	do	do.
5634	Allison & Jarratt, Asheville, N. C.	8-10-08	1.26	do	do.
5635	do	8-10-08	1.12	do	do.
5636	do	8-10-08	1.14	do	do.
5637	Bost & Newton, Hickory, N. C.	8-13-08	1.14	do	do.
5638	C. F. Kirksey, Morganton, N. C.	8-11-08	1.12	do	do.
5639	J. A. Bush, Jr., Lenoir, N. C.	8-12-08	1.19	do	do.
5640	do	8-12-08	1.27	do	do.
5641	Home Milling Co., Lenoir, N. C.	8-12-08	1.55	do	do.
5642	H. T. Newland, Lenoir, N. C.	8-12-08	1.44	do	do.
5643	Best & Thompson, Goldsboro, N. C.		1.50	do	do.
5644	Royall Grocery Co., Goldsboro, N. C.		1.25	do	do.
5645	Baker, Bizzell & Edgerton, Goldsboro, N.C.		1.29	do	do.
5646	Hadley, Harris & Co., Wilson, N. C.	7-22-08	1.18	do	do.
5647	C. Sawyer, Asheville, N. C.	8-20-08	1.13	do	do.
5719	Royall Grocery Co., Goldsboro, N. C.	7- 9-08	1.33	do	do.
5720	Ruffin-High Co., Wilson, N. C.	7-22-08	1.23	do	do.
5721	Wiggins Grocery Co., Wilson, N. C.	7-22-08	1.12	do	do.

However, finely ground mineral matter and corn meal have both been used to adulterate it. The mineral matter is easily detected by the increased weight of the ash, and the corn meal by the use of the microscope. The starch from corn and wheat appears almost as different under the microscope as the whole grains do to the eye alone.

Sixty-eight samples of wheat flour were examined by means of the microscope for adulteration with corn starch or fluorine. None were found adulterated.

Gluten in Flour.—The per cent of gluten in flour is the best index to its bread-making qualities. The quality of the gluten is a factor of almost equal importance. Gluten, as such, does not exist in wheat or in flour. Gluten is produced by the union of two proteid bodies present in the wheat or flour when the latter is moistened with water or doughed. These two proteid bodies are known as gliadin and glutenin. They are very different in character. Glutenin is a grayish, opaque, powdery substance, while gliadin is a yellowish or

brownish, nearly transparent, glue-like body. It is the gliadin which gives to gluten the tenacity and elasticity which bind the flour particles together, and yet permit the dough to expand and become light by enclosing bubbles of gas.

RESULTS OF THE EXAM

Laboratory Number.	Material and Brand from Label	Manufacturer or Wholesaler.
5693	Flour, Piedmont Belle	Hickory Milling Co., Hickory, N. C.
5694	Flour, Our Expert	Bridgewater Milling Co., Bridgewater, N. C.
5695	Flour, Tip Top	Dunlop Mills, Richmond, Va.
5696	Flour, Faultless	Lynchburg Milling Co., Lynchburg, Va.
5697	Flour, Sea Foam	Michigan Milling Co., Ann Harbor, Mich.
5698	Flour, Best in the World	do
5699	Flour, Imperial	Dan Valley Mills, Danville, Va.
5700	Flour, Monarch	Stonewall Roller Mills, Woodstock, Va.
5701	Flour, Pure Gold	Northwestern Elevator and Mill Co., Mt. Vernon, Ohio
5702	Flour, Southern Belle	do
5703	Flour, White Rose	Voight Milling Co., Grand Rapids, Mich.
5704	Flour, Champion	Valley City Milling Co., Grand Rapids, Mich.
5723	Flour	Peninsular Milling Co., Flint, Mich.
5724	Flour, Colonial	Dan Valley Mills, Danville, Va.
5725	Flour	Voight Milling Co., Grand Rapids, Mich.
5726	Flour	John T. Bailey Co., Philadelphia, Pa.
4721	Flour	
4747	Flour, Magnolia	Page Milling Co., Luray, Va.
4748	Flour, Cream of Wheat	do
5199	Flour	Vestal & Brun, Winston, N. C.
5650	Flour, J. E. M.	J. E. M. Milling Co., Frankfort, Ky.
5651	Flour, Biltmore	Asheville Milling Co., Asheville, N. C.
5652	Flour, Obelisk	Ballard & Ballard, Louisville, Ky.
5653	Flour, Climax	Asheville Milling Co., Asheville, N. C.
5654	Flour, Lily of the Valley	R. J. Gaston, Hominy, N. C.
5655	Flour, Purina Graham	Ralston Purina Co., St. Louis, Mo.
5656	Flour, Snow Bank	Stradley & Luther, Asheville, N. C.
5657	Flour, Omega	H. C. Cole Milling Co., Chester, Ill.
5658	Flour, Sawyer's Dinner Party	Eiglehart, Evansville, Ind.
5659	Flour, Purina Graham	Ralston Purina Co., St. Louis, Mo.
5660	Flour, Omega	H. C. Cole Milling Co., Chester, Ill.
5661	Flour, Aulander	Noland-Rowland Co., Asheville, N. C.

The glutenin serves to fix the gliadin and to distribute it through the dough, and without it the gliadin would tend to gather in sticky masses in separate portions of the dough.

INATION OF FLOUR.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Ash—Per Cent.	Microscopic Examination.	Adulterants.
5693	Bost & Newton, Hickory, N. C.	0.37	Wheat product	None found *
5694	do	0.29	do	do.
5695	do	0.29	do	do.
5696	Wiggins Grocery Co., Wilson, N. C.	0.37	do	do.
5697	Best & Thompson, Goldsboro, N. C.	0.45	do	do.
5698	do	0.29	do	do.
5699	do	0.22	do	do.
5700	do	0.33	do	do.
5701	Baker, Bizzell & Edgerton, Goldsboro, N. C.		do	do.
5702	do	0.54	do	do.
5703	Royall Grocery Co., Goldsboro, N. C.	0.43	do	do.
5704	T. R. Lamm, Wilson, N. C.	0.41	do	do.
5723	Hadley, Harris & Co., Wilson, N. C.	0.39	do	do.
5724	Wiggins Grocery Co., Wilson, N. C.	0.64	do	do.
5725	Royall Grocery Co., Goldsboro, N. C.	0.39	do	do.
5726	Cash Grocery Store, Wilson, N. C.	0.43	do	do.
4721	J. H. Bryant, Raleigh, N. C.		do	do.
4747		0.17	do	do.
4748		0.21	do	do.
5199	J. H. Hanson, Yadkinville, N. C.	0.41	do	do.
5650	Yates & McGuire, Asheville, N. C.	0.17	do	do.
5651	Stradley & Luther, Asheville, N. C.		do	do.
5652	do	0.45	do	do.
5653	do	0.27	do	do.
5654	do	0.27	do	do.
5655	do	1.58	do	do.
5656	do	0.35	do	do.
5657	do	0.39	do	do.
5658	C. Sawyer, Asheville, N. C.	0.36	do	do.
5659	Noland-Rowland Co., Asheville, N. C.		do	do.
5660	do	0.36	do	do.
5661	do	0.36	do	do.

*These samples of flour were not examined for bleaching agents.

RESULTS OF THE EXAMINA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5662	Flour, Pillsbury's Best	Pillsbury Mills, Minneapolis, Minn.
5663	Flour, Richelieu	Sprague, Warner & Co., Chicago, Ill.
5664	Flour, La Rose	Austin, Nichols & Co., New York, N. Y.
5665	Flour, Purity	Paris Milling Co., Paris, Ky.
5666	Flour, Obelisk	Ballard & Ballard, Louisville, Ky.
5667	Flour, Climax	Asheville Milling Co., Asheville, N. C.
5669	Flour, Calla Lily	Newport Mill Co., Newport, Tenn.
5670	Flour, Biltmore	Asheville Milling Co., Asheville, N. C.
5671	Flour, Town Talk	Lawrenceburg Roller Mills Co., Lawrenceburg, Ind.
5672	Flour, Pillsbury's Best	Pillsbury Mills, Minneapolis, Minn.
5673	Flour, Monitor	Statesville Flour Mill Co., Statesville, N. C.
5674	Flour, Crystal	do
5675	Flour, Daisy	Glen Alpine Mill Co., Glen Alpine, N. C.
5676	do	do
5677	Flour, Golden Gate	do
5679	Flour, Banner	J. Allen Smith & Co., Knoxville, Tenn.
5680	Flour, Sleepy Eye	Sleepy Eye Milling Co., Sleepy Eye, Minn.
5681	Flour, Majestic	J. Allen Smith & Co., Knoxville, Tenn.
5682	Flour, Morristown Choice	Morristown Mills, Morristown, Tenn.
5683	Flour, Mayflower	Lenoir Mills, Lenoir, N. C.
5684	Flour, Happy Valley	do
5685	Flour, Piedmont Valley	Home Milling Co., Lenoir, N. C.
5686	Flour, Snow Flake	do
5687	do	do
5689	Flour, Mayflower	Lenoir Mills, Lenoir, N. C.
5690	Flour, Happy Valley	do
5691	Flour, Warlick's Best	Newton Roller Mills, Newton, N. C.
5692	Flour, Blue Ridge	Hickory Milling Co., Hickory, N. C.
5199	Flour	S. T. Hinshaw, Winston, N. C.
5200	do	Shore & Shore, Winston, N. C.
5201	do	J. H. Hanson, Winston, N. C.
5377	Flour, Peerless Patent	Carolina Roller Mill Co., Durham, N. C.
5378	Flour, Triumph	Statesville Flour Mill, Statesville, N. C.
5379	Flour, Crystal	do
5380	Flour, Pride of Richmond	J. L. Koiner Flour Mill, Richmond, Va.
5381	Flour, Acme	Strasburg Steam Flouring Co., Strasburg, Va.

TION OF FLOUR—CONTINUED.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Ash—Per Cent.	Microscopic Examination.	Adulterants.
5662	Noland-Rowland Co., Asheville, N. C.	0.24	Wheat product	None found.*
5663	do	0.40	do	do.
5664	do	0.36	do	do.
5665	do	0.44	do	do.
5666	do	0.33	do	do.
5667	Allison & Jarratt, Asheville, N. C.	0.29	do	do.
5669	do	0.41	do	do.
5670	do	0.42	do	do.
5671	do	0.46	do	do.
5672	do	0.53	do	do.
5673	W. A. Ross, Morganton, N. C.	0.27	do	do.
5674	Green & Kincaid, Morganton, N. C.	0.42	do	do.
5675	do	0.55	do	do.
5676	P. G. Harbison, Morganton, N. C.	0.45	do	do.
5677	C. F. Kirksey, Morganton, N. C.	0.28	do	do.
5679	Shell Grain and Feed Co., Hickory, N. C.	0.38	do	do.
5680	do	0.39	do	do.
5681	do	0.54	do	do.
5682	do	0.43	do	do.
5683	H. T. Newland, Lenoir, N. C.	0.37	do	do.
5684	do	0.35	do	do.
5685	Home Milling Co., Lenoir, N. C.	0.48	do	do.
5686	do	0.50	do	do.
5687	J. A. Bush, Jr., Lenoir, N. C.	0.44	do	do.
5689	do	0.37	do	do.
5690	do	0.56	do	do.
5691	Bost & Newton, Hickory, N. C.	0.24	do	do.
5692	do	0.35	do	do.
5199	J. H. Hanson, Yadkinville, N. C.	0.44	do	do.
5200	do	0.40	do	do.
5201		0.47	do	do.
5377	G. S. Terrell, Raleigh, N. C.		do	do.
5378	do		do	do.
5379	Julius Heller, Raleigh, N. C.		do	do.
5380	G. T. Powell, Raleigh, N. C.		do	do.
5381	Rudy & Buffaloe, Raleigh, N. C.		do	do.

*These samples of flour were not examined for bleaching agents.

BREAKFAST FOODS.

BY C. D. HARRIS.

Preparation.—Partially prepared or so-called breakfast foods are common articles of diet in American families. They consist of partially baked or softened cereals, prepared in different ways or sometimes eaten practically whole, as in the case of cracked wheat.

Many of them have been subjected to a high temperature, by which the starch grains are softened. The hulls and skins are removed from the cereals, so the product does not represent the whole grain, but only a portion thereof.

The main object in the manufacture appears to be the preparation of a food which can be made ready for the table in a short while. It is probable that too little time is consumed in the final cooking of these breakfast foods, and, instead of using only a few moments in the preparation, their wholesomeness, palatability and digestibility would be improved by subjecting them for a longer time to the temperature of boiling water.

Classification.—Breakfast foods may be divided into three classes:

(1) Raw cereal products.

(2) Prepared cereal products (cooked).

(3) Medicated cereal products.

The medicated cereal products have added to them spices, sugars, gluten, salt, flour, flavoring extracts, etc.

The raw cereal can be changed to a prepared product by cooking, and into a medicated product by treatment with a ferment or malt. Malt does not act on raw starch directly; so the malting and cooking are carried on at the same time. The starch is changed into a soluble form by the heat, and into sugar by the malt. In making the original breakfast foods, the idea was to get the starch into a predigested form, but lately these ideas have been lost sight of, and these foods have been predigested to only a small degree.

The nutritive value of the different breakfast foods is based upon their content of digestible nutrients. It has been shown that the well-cooked cereals are more digestible than the raw or malted ones. The advantage that the prepared and malted foods have over the raw ones is that they come to the consumer ready for immediate consumption, and the preliminary preparation of boiling is not required.

The claim that the prepared foods are predigested only applies to the malted foods, and, as only a part of the starch in these is converted, they are only predigested to a small degree.

Use of Breakfast Foods.—Of late years breakfast foods have been growing more and more popular, nearly all the cereals being now represented. The oatmeals have been used for a long time and are almost a constant article of diet on the breakfast table. Wheat and corn are perhaps the next two that are more largely used, and rice is coming rapidly into general use.

Adulterants.—The chemical analyses and microscopic examination show that the breakfast foods are almost, if not entirely, free from adulteration. Com-

mon salt is used in some, which tends to increase the per cent of ash to such an extent that it might be supposed mineral matter had been added, but none has been found.

DISCUSSION OF RESULTS.

A conception of the relative merits of the different kinds of breakfast foods may be obtained by examining the figures in the table below, especially the columns marked "Protein" and "Fat." The higher these two constituents, the more nutritious is the food. It will be readily seen that the oat products contain from three to six per cent more protein and from six to seven per cent more fat than the other foods in the table, and are therefore of much more nutritive value. It is shown by the analyses that the wheat products rank second, followed by the corn and rice products. It is also shown that there is some variation in the analyses of the same brands, which may be due to the quality of the cereal used.

Nineteen samples of breakfast foods were examined, and all were found free from adulteration.

STARCH GRAINS.

In very finely ground substances, such as flour, the adulterants cannot be seen with the naked eye, and the fraud is only brought out when a high-power microscope is used. In examining flours with the microscope, and to get at their composition, the difference in the starch granules of the various grains is taken advantage of.

Cereal grains are composed largely of starch, the quantity ranging from sixty to more than eighty per cent of the entire weight of the dry hulled kernels. The starch is collected in almost a pure state in the inner portion of the grain, smaller portions being found in the coats, and only a trace or none at all in the germs. The starches of the cereals have many common properties. They are, as far as can be determined chemically, identical.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5705	Biltmore Wheat Hearts	The Wheat Hearts Co., Asheville, N. C.	S. R. Lentz, Charlotte, N. C.
5706	Price's Wheat Flaked Celery Food.	Price Cereal Food Co., Chicago, Ill.	do
5707	Ralston Health Food	Ralston Purina Co., St. Louis, Mo.	do
5710	Cream of Wheat	Cream of Wheat Co., Minneapolis, Minn.	L. L. Sarratt, Charlotte, N. C.
5713	Ferndell Breakfast Food	Sprague, Warner & Co., Chicago, Ill.	Miller Van Ness, Charlotte, N. C.
5715	Wheatena	Wheatena Co., New York, N. Y.	Gates & McGuire, Asheville, N. C.
5717	Staff-of-life	Julian P. Thomas, M. D., New York, N. Y.	Noland-Rowland Grocery Co., Asheville, N. C.
6067	Pettijohn's Breakfast Food	The American Cereal Co., Chicago, Ill.	J. R. Ferrall & Co., Raleigh, N. C.
5711	Egg-O-See	Egg-O-See Cereal Co., Chicago, Ill.	Miller Van Ness, Charlotte, N. C.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5708	Post Toasties	Postum Cereal Co., Battle Creek, Mich.	S. R. Lentz, Charlotte, N. C.
5712	Korn Kinks	The H-O Co., Buffalo, N. Y.	Miller Van Ness, Charlotte, N. C.
5714	Maiz-all	Quaker Oats Co., Chicago, Ill.	do
6068	Corn Flakes	Egg-O-See Cereal Co., Chicago, Ill.	J. R. Ferrall & Co., Raleigh, N. C.

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
6065	Puffed Rice	Quaker Oats Co., Chicago, Ill.
5718	Buckwheat	The H-O Co., Buffalo, N. Y.
6066	Rolled White Oats	Quaker Oats Co., Chicago, Ill.
5727	Tapioca, Royal Pearl	Parrish Bros., Baltimore, Md.
5728	Tapioca, Eagle	D. R. James & Bros., New York, N. Y.

SAGO

5729	Sago (Pearl)	Newton Tea and Spice Co., Cincinnati, Ohio

BREAKFAST FOODS—WHEAT PRODUCTS.

Laboratory Number.	Date of Purchase.	Protein—Per Cent.	Fat—Per Cent.	Crude Fiber—Per Cent.	Ash—Per Cent.	Microscopic Examination.	Adulterants.
5705	7-6-08	11.37	2.01	1.85	1.33	Wheat product	None found.
5706	7-6-08	11.28	1.48	3.25	1.59	do	do.
5707	7-6-08	11.75	1.87	1.07	1.24	do	do.
5710	7-6-08	11.50	1.34	0.17	0.57	do	do.
5713	7-6-08	13.50	1.38	1.10	1.20	do	do.
5715	7-28-08	10.75	2.48	1.82	1.19	do	do.
5717	7-28-08	12.00	1.27	2.20	2.26	do	do.
6067	9-30-08	10.25	2.53	2.62	1.90	do	do.
5711	7-6-08	12.62	1.83	1.22	1.88	do	do.

BREAKFAST FOODS—CORN PRODUCTS.

Laboratory Number.	Date of Purchase.	Protein—Per Cent.	Fat—Per Cent.	Crude Fiber—Per Cent.	Ash—Per Cent.	Microscopic Examination.	Adulterants.
5708	7-6-08	7.50	0.68	0.75	1.33	Corn product	None found.
5712	7-6-08	6.87	0.48	1.25	1.29	do	do.
5714	7-6-08	8.25	0.37	0.24	1.24	do	do.
6068	9-30-08	7.37	0.62	0.05	1.61	do	do.

BREAKFAST FOODS—RICE, BUCKWHEAT, ETC.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Date of Purchase.	Protein—Per Cent.	Fat—Per Cent.	Crude Fiber—Per Cent.	Ash—Per Cent.	Adulterants.
6065	J. R. Ferrall & Co., Raleigh, N. C.	Sept. 30, 1908	8.12	0.50	0.375	.56	None found.
5718	J. D. Lee, Wilson, N. C.	July 9, 1908	11.87	2.03	0.45	3.00	do.
6066	J. R. Ferrall & Co., Raleigh, N. C.	Sept. 30, 1908	15.25	7.88	1.35	2.04	do.
5727	M. E. Bizzell, Goldsboro, N. C.	July 9, 1908	0.87	0.32	0.02	0.16	do
5728	do	July 9, 1908	1.50	0.38	0.30	0.39	do.

PRODUCT.

5729	W. H. Taylor & Co., Wilson, N. C.	July 22, 1908	0.75	0.28	0.25	0.57	None found.

PHOSPHATES.

Phosphates are usually nonalcoholic. Besides the adulterants usually found in soda waters, phosphates often contain chemical preservatives.

RESULTS OF THE EXAM

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5327	Phosphate, Mezzo	Anderson & Co., Atlanta, Ga.
5391	Phosphate, Peach	Gast, Croft & Co., Louisville, Ky.
5390	Phosphate, Blackberry	do

BOTTLED SODA WATERS.

The bottling of soda waters is getting to be quite an industry in the State. Almost every town has one or more plants for bottling soda waters and other summer drinks.

The syrups from which certain products are made are purchased by the bottler, and he only adds carbonated water to them. These are known as specialty drinks, and are usually sold under trade or proprietary names. However, the greater number of these drinks are made by the bottlers by mixing the flavoring, coloring, syrup, etc., and adding the carbonated water.

The bottling process is comparatively simple, and much of it in the State is in the hands of men with very little intelligence. These drinks are often bottled under dirty and unsanitary conditions, and, unless good attention is given them, they may be the source of much sickness and disease. The labels for these drinks are usually furnished by the manufacturer of the flavoring from which the drink is made. As the manufacturer of the flavoring and the labels does not ship the finished product into the State, he cannot be held for

Only three samples were examined, and two of the three were found to be adulterated, containing benzoates. They also ran rather high in alcohol.

INATION OF PHOSPHATES.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Alcohol—Per Cent by Vol.	Adulterants.	
			Preservatives.	Coloring Matter.
5327	Wm. Shelton, Speedwell, N. C.	0.54	None found	None found.
5391	L. J. Williams, West Raleigh, N. C.	6.65	Benzoic acid	do.
5390	do	6.50	do	do.

misbranding under the National Food Law. For that reason the bottler of a product will have to be held strictly responsible for his product under the law. The so-called flavoring extracts from which many soda waters are made are often misrepresented to the bottlers. It is claimed that they are fruit juices, extracts, etc., when they are entirely or partially artificial products. They have usually been labeled fruit products, often showing on the label an attractive-looking picture of the fruit from which the product was supposed to be made.

There is a tendency among the soda-water bottlers not to label these products at all. The rules of the Board of Agriculture on labeling require that every package must be labeled, and the label must bear the name and address of the bottler.

A large number (144) of samples of these goods were examined, and about 55 per cent of them were found to be adulterated.

The principal adulterants found in these products are coal-tar dyes and artificial flavors, without the presence of the latter being stated on the label.

RESULTS OF THE EXAMINATION OF BOTTLED SODA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
6045	Soda Water, Bludwine	Crescent Bottling Co., Hendersonville, N. C.	
6046	Soda Water, Pineapple	Hickory Bottling Works, Hickory, N. C.	
6047	Soda Water, Swiss Cream	do	
6048	Soda Water, Peach	do	
6049	Soda Water, Cream	Campbell Bottling and Supply Co., Hickory, N. C.	
6050	Soda Water, Peach	do	
6051	Soda Water, Strawberry	do	
6052	Soda Water, Cherry Phosphate.	do	
6053	Soda Water, Cream	High Point Bottling Co., High Point, N. C.	
6054	Soda Water, Strawberry	Coca-Cola Bottling Co., Salisbury, N. C.	
6055	Soda Water, Lemon	do	
6056	Soda Water, Cherry Phosphate.	do	
6080	Soda Water, Peach Mellow.	Acme Bottling Works, Kinston, N. C.	
6083	Soda Water, Chocolate Cream.	do	
6084	Soda Water, Cherry Phosphate.	do	
6086	Soda Water, Orange	Pepsi-Cola Bottling Works, Kinston, N. C.	
6087	Soda Water, Grape Champagne (imitation).	do	
6088	Soda Water, Rootbeer, Crescent.	do	
6089	Soda Water, Iron Brew	Sumrell & McCoy Bottling Works, Kinston, N. C.	
6091	Soda Water, Real Chocolate.	Crown Bottling Works, New Bern, N. C.	
5238	Soda Water, Hop Ale	American Beverage Co., Atlanta, Ga.	Cel-i-ko Bottling Works, Raleigh, N. C.
6024	Soda Water, Cherry Phosphate.	D. R. Huffines, Greensboro, N. C.	
6025	Soda Water, Orangeade	do	
6026	Soda Water, Peach Bounce.	do	
6027	Soda Water, Cream	do	
6028	Soda Water, Lemon	do	
6029	Soda Water, To-Ko	do	
6030	Soda Water, Strawberry	do	
6031	Soda Water, Digestol	do	
6032	Soda Water, Peach Mellow.	C. H. Scales, Reidsville, N. C.	
6033	Soda Water, Strawberry	F. & F. Bottling Works, North Wilkesboro, N. C.	
6034	Soda Water, Lemon Sour	do	
6035	Soda Water	do	
6036	Soda Water, Rasport	Forester Grocery Co., North Wilkesboro, N. C.	
6037	Soda Water, Cream	do	
6038	Soda Water, Eggnog	do	
6039	Soda Water, Strawberry	do	

WATERS AND OTHER NONALCOHOLIC BEVERAGES.

Laboratory Number	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
6045	None found	None found	Misbranded, not properly labeled.
6046	do	do	Not properly labeled.
6047	do	do	
6048	do	do	Not properly labeled.
6049	do	do	do.
6050	do	do	Misbranded, not properly labeled.
6051	do	Coal-tar dye	do.
6052	do	do	do.
6053	do	None found	do.
6054	do	Coal-tar dye	Misbranded.
6055	do	None found	do.
6056	do	Coal-tar dye	Misbranded, not properly labeled.
6080	do	do	Not properly labeled.
6083	do	None found	Misbranded, not properly labeled.
6084	do	Coal-tar dye	
6086	do	do	Misbranded.
6087	do	None found	Misbranded, not properly labeled.
6088	do	do	do.
6089	do	do	
6091	do	do	Misbranded, not properly labeled.
5238	do	do	Not properly labeled, contains caffeine.
6024	do	Coal-tar dye	Misbranded.
6025	do	do	do.
6026	do	do	do.
6027	do	None found	
6028	do	Coal-tar dye	Misbranded, not properly labeled.
6029	do	do	Not properly labeled.
6030	do	do	Misbranded, not properly labeled.
6031	do	do	Not properly labeled.
6032	do	do	do.
6033	do	do	Misbranded, not properly labeled.
6034	do	do	Not properly labeled.
6035	do	do	Not labeled.
6036	do	do	Not properly labeled.
6037	do	do	do.
6038	do	do	Misbranded, not properly labeled.
6039	do	do	do.

RESULTS OF THE EXAMINATION OF BOTTLED SODA WATERS

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
6040	Soda Water, Peach Mellow.	Forester Grocery Co., North Wilkesboro, N. C.	
6041	Soda Water, Peach	Crescent Bottling Co., Hendersonville, N. C.	
6042	Soda Water, Lemon Sour	do	
6044	Soda Water, Pickmeup	do	
5239	Soda Water, Hop Ale	American Beverage Co., Atlanta, Ga.	Cel-i-ko Bottling Works, Raleigh, N. C.
5492	Soda Water, Ginger Ale	Pepsi-Cola Bottling Co., Wadesboro, N. C.	
5493	Soda Water, Strawberry	do	
5494	Soda Water, Lemon Sour	do	
5495	Soda Water, Peach Juice	do	
5496	Soda Water, Sarsaparilla	Anson Bottling Works, Wadesboro, N. C.	
5497	Soda Water	do	
5498	do	do	
5499	Soda Water, Ginger Ale, Rainbow.	do	
5500	Soda Water, Lemon Sour	Rockingham Bottling Works, Rockingham, N. C.	
5501	Soda Water, Coffee, Royal Crown.	C. Valaer Bottling Works, Charlotte, N. C.	T. F. Tadlock, Monroe, N. C.
5565	Soda Water, Eureka	Norton Cider and Vinegar Co., Statesville, N. C.	
5587	Soda Water, Pepsi-Cola	Pepsi-Cola Co., New Bern, N. C.	E. Dannenberg, Wilson, N. C.
5593	Soda Water, Rye-Ola	Monroe Bottling Works, Monroe, N. C.	
5608	Soda Water, Strawberry	Pepsi-Cola Bottling Works, Greensboro, N. C.	
6018	Soda Water, Cream, Jersey.	Greensboro Coca-Cola Bottling Co., Greensboro, N. C.	
6019	Soda Water	Greensboro Steam Bottling Co., Greensboro, N. C.	
6020	Soda Water, Strawberry, Game Cock.	do	
6021	Soda Water, Cherry Phosphate.	do	
6022	Soda Water, Peach Mellow.	do	
6023	Soda Water, Bracer	do	
6082	Soda Water, Hop Ale	American Beverage Co., Atlanta, Ga.	Acme Bottling Works, Kinston, N. C.
5471	Soda Water, Iron Brew	S. T. Boon Bottling Works, Fayetteville, N. C.	
5472	Soda Water, Lemon Sour (imitation).	do	
5473	Soda Water, Celery Cola	do	
5474	Soda Water, Peach	do	
5475	Soda Water, Lemon	do	
5476	Soda Water, Ginger Ale (artificial).	Coca-Cola Bottling Works, Fayetteville, N. C.	
5477	Soda Water, Strawberry (artificial).	do	
5478	Soda Water, Wild Cherry Phosphate.	do	
5479	Soda Water, Peach flavor (artificial).	do	
5480	Soda Water, Cream flavor.	do	

AND OTHER NONALCOHOLIC BEVERAGES—CONTINUED.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
6040	None found	Coal-tar dye	Not properly labeled.
6041	do	do	Misbranded, not properly labeled.
6042	do	None found	do.
6044	do	do	Not properly labeled.
5239	do	do	Not properly labeled, contains caffeine.
5492	do	Coal-tar dye	Misbranded, not properly labeled.
5493	do	do	do.
5494	do	do	do.
5495	do	do	do.
5496	do	do	Misbranded.
5497	do	do	Not labeled.
5498	do	do	do.
5499	do	do	Misbranded, not properly labeled.
5500	do	None found	Misbranded.
5501	do	do	Not properly labeled.
5565	do	Coal-tar dye	
5587	do	None found	Contains caffeine.
5593	do	do	
5608	do	Coal-tar dye	Misbranded, not properly labeled.
6018	do	None found	do.
6019	do	do	Not properly labeled.
6020	do	Coal-tar dye	Misbranded.
6021	do	do	Misbranded, not properly labeled.
6022	do	do	do.
6023	do	None found	Not properly labeled.
6082	do	do	Not properly labeled, contains caffeine.
5471	do	do	
5472	do	Coal-tar dye	Not properly labeled.
5473	do	do	do.
5474	do	do	Misbranded, not properly labeled.
5475	do	None found	Misbranded.
5476	do	Coal-tar dye	Not properly labeled.
5477	do	do	Misbranded, not properly labeled.
5478	do	do	do.
5479	do	do	do.
5480	do	None found	do.

RESULTS OF THE EXAMINATION OF BOTTLED SODA WATERS

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5481	Soda Water, Pineapple flavor (artificial).	Coca-Cola Bottling Works, Raleigh, N. C.	
5482	Soda Water, Orange	Pepsi-Cola Bottling Works, Fayetteville, N. C.	
5483	Soda Water, Cream	do	
5484	Soda Water, Chocolate	do	
5485	Soda Water, Lemon	do	
5486	Soda Water, Ginger Ale	do	
5488	Soda Water, Ginger Ale, Buffalo Lick.	do	
5489	Soda Water, Peach Mellow.	do	
5490	Soda Water, Lemon	F. M. Hightower, Wadesboro, N. C.	
5491	Soda Water, Ginger Ale	do	
5450	Soda Water, Lemon	Parker Bottling Works, Laurinburg, N. C.	
5451	Soda Water, Sarsaparilla	do	
5452	Soda Water, Lemon (artificial).	Laurinburg Bottling Works, Laurinburg, N. C.	
5453	Soda Water, Strawberry	do	D. L. Jackson & Son, Laurinburg, N. C.
5454	Soda Water	do	do
5455	Soda Water, Sunbeam Ginger Ale.	Maxton Bottling Works, Maxton, N. C.	
5456	Soda Water, Strawberry	do	
5457	Soda Water, Lemon Sour	do	
5458	Soda Water	do	
5459	Soda Water, Cherry Cocktail.	Artesian Bottling Co., Lumberton, N. C.	
5460	Soda Water	do	
5461	Soda Water, Sarsaparilla	do	
5463	Soda Water, Chocolate	do	
5464	Soda Water, Peach Bounce (imitation).	do	
5465	Soda Water, Capital Club Ginger Ale.	do	
5466	Soda Water, Sarsaparilla	S. T. Boon Bottling Works, Fayetteville, N. C.	
5467	Soda Water, Eggnog	do	
5468	Soda Water, Ginger Ale	do	
5469	Soda Water, Cherry Cocktail.	do	
5470	Soda Water, Strawberry (artificial).	do	
5208	Soda Water, Ginger Ale, Mead.	Brannon Carbonating Co., Charlotte, N. C.	
5209	Soda Water, Hire's Rootbeer.	do	
5210	Soda Water, Peach Phosphate (artificial).	do	
5211	Soda Water, Brannon's Cream (artificial).	do	
5212	Soda Water, Brannon's Chocolate Cream (artificial).	do	
5213	Soda Water, Brannon's Rootbeer (artificial).	do	

AND OTHER NONALCOHOLIC BEVERAGES—CONTINUED.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5481	None found	Coal-tar dye	Misbranded, not properly labeled.
5482	do	do	do.
5483	do	None found	do.
5484	do	do	do.
5485	do	do	Misbranded.
5486	do	Coal-tar dye	Not properly labeled.
5488	do	do	Misbranded.
5489	do	do	do.
5490	do	do	Misbranded, not properly labeled.
5491	do	do	do.
5450	do	do	do.
5451	do	None found	Not properly labeled.
5452	do	do	Misbranded, not properly labeled.
5453	do	Coal-tar dye	Misbranded.
5454	do	None found	Not labeled.
5455	do	Coal-tar dye	do.
5456	do	do	Misbranded, not properly labeled.
5457	do	do	do.
5458	do	None found	Not labeled.
5459	do	Coal-tar dye	Misbranded, not properly labeled.
5460	do	None found	Not labeled.
5461	do	do	Not properly labeled.
5463	do	do	Misbranded.
5464	do	Coal-tar dye	Not properly labeled.
5465	do	do	do.
5466	do	do	Misbranded.
5467	do	do	do.
5468	do	do	do.
5469	do	do	do.
5470	do	do	Not properly labeled.
5208	do	None found	
5209	do	do	
5210	do	do	Artificial product.
5211	do	Coal-tar dye	do.
5212	do	None found	do.
5213	do	do	do.

RESULTS OF THE EXAMINATION OF BOTTLED SODA WATERS

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5214	Soda Water, Brannon's Orangeade (artificial).	Brannon Carbonating Co., Charlotte, N. C.	
5215	Soda Water, Brannon's Sarsaparilla (artificial).	do	
5216	Soda Water, Brannon's Strawberry (artificial).	do	
5217	Soda Water, Brannon's Cherry Phosphate (artificial).	do	
5218	Soda Water, Brannon's Ginger Ale (artificial).	do	
5219	Soda Water, Raspberry (artificial).	do	
5220	Soda Water, Cafe-Cola (artificial).	do	
5221	Soda Water, West India Lemon Sour (artificial).	do	
5222	Soda Water, Lemon Phosphate (artificial).	do	
5223	Soda Water, Pineapple Punch (artificial).	do	
5446	Soda Water, Peach Mellow (artificial).	Parker Bottling Works, Laurinburg, N. C.	
5447	Soda Water, Cream	do	
5448	Soda Water, Strawberry	do	
5449	Soda Water, Ginger Ale	do	
6092	Soda Water, Pepper's Phos-Ferrates.	The A. M. & B. Co., Waco, Tex.	Crown Bottling Works, New Bern, N. C.
6094	Soda Water, Cold-Cola	Carolina Beverage Co., New Bern, N. C.	do
6095	Soda Water, Lemon Sour	Crown Bottling Works, New Bern, N. C.	
6096	Soda Water, Strawberry	do	
6097	Soda Water, Pepsin-Ola	do	
6098	Soda Water, Lemon	J. F. Taylor Bottling Works, New Bern, N. C.	
6099	Soda Water, Ginger Ale	do	
6100	Soda Water, Sarsaparilla	do	
6101	Soda Water, Lemon Sour	do	
6102	Soda Water, Afri-Kola	do	
6103	Soda Water, Imitation Champagne.	do	
6104	Soda Water, Eggnog	do	
6105	Soda Water, Rootbeer, Diamond.	Coca-Cola Bottling Works, New Bern, N. C.	
6106	Soda Water, Lemon Sour	do	
6107	Soda Water, Real Chocolate.	do	
6108	Soda Water, Ginger Ale, Superior Quality.	do	
6122	Soda Water, Kos-Kola	Henderson Bottling Works, Henderson, N. C.	
6123	Soda Water, Strawberry (artificial).	do	
6124	Soda Water, Sarsaparilla (artificial).	do	
6125	Soda Water, Ginger Ale (artificial).	do	
6126	Soda Water, Cream	do	

AND OTHER NONALCOHOLIC BEVERAGES—CONTINUED.

Laboratory Number.	Adulterants.		Remarks and Conclusions.
	Preservatives.	Coloring Matter.	
5214	None found	Coal-tar dye	Artificial product.
5215	do	None found	do.
5216	do	Coal-tar dye	do.
5217	do	None found	do.
5218	do	do	do.
5219	do	Coal-tar dye	do.
5220	do	None found	
5221	do	do	Artificial product.
5222	do	do	do.
5223	do	do	do.
5446	do	Coal-tar dye	Artificial product, not properly labeled.
5447	do	do	do.
5448	do	do	Misbranded, not properly labeled.
5449	do	do	Artificial product, misbranded, not properly labeled.
6092	do	None found	Misbranded, not properly labeled.
6094	do	do	do.
6095	do	Coal-tar dye	
6096	do	do	
6097	do	None found	Misbranded, misrepresented.
6098	do	do	Misbranded, misrepresented; not properly labeled.
6099	do	do	Misbranded, not properly labeled.
6100	do	do	
6101	do	Coal-tar dye	Not properly labeled.
6102	do	do	
6103	do	do	Misrepresented, not properly labeled.
6104	do	do	Misbranded, not properly labeled.
6105	do	None found	Not properly labeled.
6106	do	do	Misbranded, not properly labeled.
6107	do	do	do.
6108	do	do	do.
6122	do	do	Not properly labeled.
6123	do	Coal-tar dye	do.
6124	do	None found	do.
6125	do	do	do.
6126	do	do	do.

CIDERS AND ARTIFICIAL OR IMITATION CIDERS.

To comply with the requirements of the State Food Law a cider must be made entirely of unadulterated fruit juice and be sold under the name of the fruit from which it has been made. No color or flavor shall be added, unless the fact is made known by the proper label attached to each package. When artificially colored or flavored, these products must be sold as artificial, imitation or compound products or their sale will be illegal, and therefore prevented. Their sale will also be prevented if they contain any chemical preservative, except 0.008 of one per cent of sulphurous acid, which is enough only to fumigate the cask.

Forty samples of this class of beverages have been examined, eleven (or 27.5 per cent) of which proved to be adulterated. The adulterated samples contained chemical preservatives, coal-tar dyes or artificial flavor, with the presence of

RESULTS OF THE EXAMINATION OF CIDERS

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5314	Cider, Apple	W. P. Matthews & Son, Raleigh, N. C.	W. P. Matthews & Son, Raleigh, N. C.
5315	----do	----do	----do
5386	Cider, Compound, Blackberry flavor.	Gast, Croft & Co., Louisville, Ky.	----do
5516	Cider, Compound	Hicks Co., Wilmington, N. C.	Frank Jessup, Red Springs, N. C.
5552	Cider, Apple, Golden Rod	E. S. Shelby Vinegar Co., Richmond, Va.	Boykin Grocery Co., Wilson, N. C.
5553	----do	----do	W. M. Washington, Kinston, N. C.
5557	----do	----do	Jas. Bethea, Whitakers, N. C.
5560	Cider Apple	W. P. Matthews & Son, Raleigh, N. C.	W. P. Matthews & Son, Raleigh, N. C.
5564	Cider, Imitation, Hotstuff		N. A. Collins (chief police), Asheville, N. C.
5570	Cider	Christian & Winfree, Richmond, Va.	J. R. Bergerson, Beaufort, N. C.
5571	----do	----do	----do
5588	Cider, Apple	W. P. Matthews & Son, Raleigh, N. C.	W. P. Matthews & Son, Raleigh, N. C.
5589	----do	----do	----do
5224	Cider, Imitation	J. E. Petty, Greensboro, N. C.	
5225	Cider, Apple		T. K. Bruner, Raleigh, N. C.
5237	Cider, White Plum	Jones Bros. & Co., Louisville, Ky.	J. G. Ball, Raleigh, N. C.
5241	Cider, Apple	J. F. Matthews, Raleigh, N. C.	J. Dannenberg, Goldsboro, N. C.
5249	Cider		J. S. Bryan, Albemarle, N. C.
5279	Cider, Compound	Anderson & Co., Atlanta, Ga.	B. H. Hooper, Speedwell, N. C.
6016	Cider	Groves & Perry, Asheville, N. C.	Swannanoa Lunch Room, Asheville, N. C.
5312	Cider, Apple	R. W. King, Raleigh, N. C.	R. C. Batchelor, Raleigh, N. C.
5313	----do	Haynor Mfg. Co., Norfolk, Va.	----do

the latter not stated on the label. A majority of these samples were wholly artificial or imitation products, while many of them were compound products containing a small quantity of fruit cider.

The adulteration and fraud practiced in this class of goods have been tremendous. More than 81 per cent of the samples examined in 1907 were found to be adulterated. It is gratifying to see that the per cent of adulteration this year has dropped down to 27.5 per cent.

On account of the sale of these products in territories where the sale of alcoholic beverages is illegal, like imitation beers, many of these samples were sent to the Department by officials or others for the determination of the amount of alcohol contained or supposed to be contained. The sale of them was often discontinued, either on account of the amount of alcohol found to be present or adulterants which rendered their sale in the State illegal.

AND IMITATION OR ARTIFICIAL CIDERS.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5314	5.50		None found	None found	Apple cider.
5315	6.00		do	do	do.
5386	6.70		do	do	Compound cider.
5516			do	do	do.
5552	7.95	9.31	do	do	Apple cider, sweetened with sugar.
5553	8.00	9.52	do	do	do.
5557	8.50	9.30	do	do	do.
5560	5.45	3.55	do	do	Apple cider.
5564	6.55		do	do	Imitation cider.
5570	6.65		do	do	Cider.
5571	6.55		do	do	do.
5588	4.95		do	do	Apple cider.
5589	0.75		do	do	Apple cider, sweet.
5224			do	do	Imitation cider.
5225			do	do	Apple cider.
5237	4.60		do	do	do.
5241	1.25		do	do	do.
5249	8.02		do	do	do.
5279	9.23		do	do	Compound cider.
6016	0.25		do	do	Cider.
5312	4.09		do	do	Compound cider, misbranded.
5313	5.60		do	do	do.

RESULTS OF THE EXAMINATION OF CIDERS AND

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5316	Cider, Apple	Haynor Mfg. Co., Norfolk, Va.	W. P. Matthews & Son, Raleigh, N. C.
5433	Cider, Imitation	California Fruit and Extract Co., Louisville, Ky.	L. C. Neal, Raleigh, N. C.
5515	do	Haynes-Piper Co., Boston, Mass.	Williams Bros., Rockingham, N. C.
5517	Cider, Manhattan	E. A. Saunders, Richmond, Va.	E. J. Hale & Son, Raleigh, N. C.
5590	Cider, Apple	R. W. King, Raleigh, N. C.	W. P. Matthews & Son, Raleigh, N. C.
5591	do	G. E. Wismon, Raleigh, N. C.	do
6060	Cider, Compound		D. Holyfield, Rockford, N. C.
5382	do		King Bros., Raleigh, N. C.
5234	Cider, Imitation, Cherry	Louisburg Bottling Works, Louisburg, N. C.	F. L. Hermon, Louisville, Ky.
5235	Cider, Imitation		J. J. Lambert, Elon College, N. C.
6013	Cider, Grape	Hendersonville Grocery Co., Hendersonville, N. C.	T. B. Crary, Brevard, N. C.
6014	Cider, Champagne	Asheville Bottling Works, Asheville, N. C.	do
6015	Cider	Gast, Croft & Co., Louisville, Ky.	Swannanoa Lunch Room, Asheville, N. C.
6017	do	Warner-Jenkinson Co., St. Louis, Mo.	Coca-Cola Bottling Co., Gastonia, N. C.
6085	Cider, Artificial, Apple	Coca-Cola Bottling Works, New Bern, N. C.	Acme Bottling Works, Kinston, N. C.
5191	Cider, Apple		Lenoir Grocery Co., Lenoir, N. C.
5194	Cider, Imitation	Gast, Croft & Co., Louisville, Ky.	Crown Bottling Works, Ashboro, N. C.
5195	Cider, Imitation, Blackberry.	Warner-Jenkinson Co., St. Louis, Mo.	Norton Cider and Vinegar Co., Statesville, N. C.

BEERS AND IMITATION BEERS.

Under the head of beers and imitation beers, eighty-six samples were examined, only four of which were found to be adulterated. Two of the four contained benzoates and the others contained coal-tar dye. The greater number by far of these samples belong to the imitation class. As standard beers cannot be sold in the State, there is quite a demand for a substitute with less alcohol than beer contains.

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5823	Beer, Imitation, Cuban Ade.	Dannenberg Bros., Goldsboro, N. C.	S. T. Smith, Raleigh, N. C.
6059	Beer	Darley Park Brewery, Baltimore, Md.	J. D. Lee, Wilson, N. C.
5203	Beer, Imitation, Hop Brew.	Dannenberg Bottling Co., Goldsboro, N. C.	E. T. Alford, Youngsville, N. C
5204	Beer, Imitation		Geo. A. Lupton, Beaufort, N. C.

IMITATION OR ARTIFICIAL CIDERS—CONTINUED.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5316	4.78		None found	None found	Compound cider, misbranded.
5433	0.10		Benzoic acid	Coal-tar dye	Adulterated.
5515			do	None found	do.
5517			do	do	do.
5590	2.50		do	do	do.
5591	2.80		do	do	do.
6060	1.50		None found	do	Compound cider.
5382			do	do	do.
5234	0.40		Salicylic acid	Coal-tar dye	Imitation product, adulterated.
5235	5.92		None found	do	do.
6013	0.15		Benzoic acid	do	Compound cider, adulterated.
6014	6.95		None found	None found	Compound cider, misbranded.
6015	1.20		do	Coal-tar dye	do.
6017	1.00		do	None found	Not properly labeled.
6085			do	do	Compound cider, misbranded; not properly labeled.
5191	8.75		None found	None found	Apple cider.
5194	6.75	10.33	Benzoic acid	do	Not labeled, adulterated.
5195	1.55	14.05	None found	Coal-tar dye	do.

As many of the dealers in this class of goods desire to know that they are not violating the prohibition laws, and as many citizens and county and city officials desire to know that the laws are not being violated, many samples of these goods are sent to the Department for the determination of the amount of alcohol present. Very little adulteration was found, and the amount of alcohol contained was usually low.

OF BEERS AND IMITATION BEERS.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5823	2.15		None found	None found	
6059	1.30		do	do	
5203	1.75		do	do	
5204	8.04		do	do	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5205	Beer, Imitation, Cuban Ade.	Home Brewing Co., Richmond, Va.	Dannenberg Bros., Goldsboro, N. C.
5206	Beer, Imitation, Hop Brew.	Dannenberg Bottling Co., Goldsboro, N. C.	J. W. Hassell, New Bern, N. C.
5207	do	do	J. C. Guthrie, New Bern, N. C.
5231	Beer, Imitation, Rikk	Gottlieb-Bauenschmidt-Straus Co., Baltimore, Md.	Fred H. Burleson, Albemarle, N. C.
5232	Beer, Imitation, Hop Brew.	Dannenberg Bottling Co., Goldsboro, N. C.	
5240	Beer, Imitation, Yellow Ade.	Robert Portner Brewing Co., Alexandria, Va.	R. L. Davis, Raleigh, N. C.
5282	Beer, Imitation, Hopine	Consumers Brewing Co., Norfolk, Va.	National Drug Co., Wilson, N. C.
5284	Beer, Imitation, Cuban Ade.	Home Brewing Co., Richmond, Va.	J. E. Haywood, Zebulon, N. C.
6043	Beer, Imitation, Schooner Brew.	National Beverage Co., Chattanooga, Tenn.	Crescent Bottling Co., Hendersonville, N. C.
6064	Beer, Imitation, Liquid Bread.	Rosenegk Brewing Co., Richmond, Va.	W. F. Young, Princeton, N. C.
6070	Beer, Imitation, Small Brew.	Portner Malt Extract Co., Alexandria, Va.	Dannenberg Bros., Goldsboro, N. C.
6109	Beer, Imitation, Tidal Wave.		W. E. Springer, Wilmington, N. C.
6090	Beer, Imitation, Hopse	Red Cliffs Co., Wheeling, West Va.	W. N. Hight, Kinston, N. C.
5597	Beer, Imitation		G. E. Carman, Mapleton, N. C.
5599	Beer, Imitation, No. 23	New South Brewing and Ice Co., Middlesboro, Ky.	J. H. Lange, Asheville, N. C.
5600	Beer, Imitation, Daisy	do	do
5601	Beer, Imitation, Reinbrau	Consumers Brewing Co., Norfolk, Va.	Gus Roundtree, New Bern, N. C.
5602	Beer, Imitation	do	do
5603	do	do	do
5604	do	do	Isaac Simmons, New Bern, N. C.
5605	do		do
5609	do	Portner Malt Extract Co., Alexandria, Va.	Ed. Denton, Raleigh, N. C.
5610	Beer, Imitation, Hop Beverage.	Home Brewing Co., Richmond, Va.	E. Dannenberg, Wilson, N. C.
5612	Beer, Imitation, Schooner Brew.	National Beverage Co., Atlanta, Ga.	J. R. Moore, Greenville, N. C.
5616	Beer, Imitation, Dukehart's Local Option.	Dukehart Mfg. Co., Baltimore, Md.	Edenton Bottling Co., Edenton, N. C.
5617	Beer, Imitation, Cuban Ade.	Dannenberg Bros., Goldsboro, N. C.	
5618	Beer, Imitation, Hop Brew.	do	
5619	Beer, Imitation, Hop Beverage.	do	
5624	Beer, Imitation, Schooner Brew.	National Beverage Co., Atlanta, Ga.	D. W. Davis & Son, Elizabeth City, N. C.
5627	Beer, Imitation, Reinbrau	Consumers Brewing Co., Norfolk, Va.	W. J. Wilson, Milwaukee, N. C.
5628	Beer, Imitation, Ner-Vo	Rosenegk Brewing Co., Richmond, Va.	W. E. Barker & Co., Mt. Airy, N. C.
5629	Beer, Imitation, Schlitz Fizz.	Jos. Schlitz Brewing Co., Milwaukee, Wis.	Sternberger Bros., Wilmington, N. C.
5630	Beer, Imitation, Tidal Wave.	Rosenegk Brewing Co., Richmond, Va.	I. F. Ormond, Goldsboro, N. C.
5435	Beer, Imitation, Amberine.	Robert Portner Brewing Co., Alexandria, Va.	Matthews & Hampton, Raleigh, N. C.
5502	Beer, Imitation, Beerine	C. Valaer Bottling Works, Charlotte, N. C.	W. T. Williams, Rockingham, N. C.
5554	Beer, Imitation, Kola Malt.	Virginia Brewing Co., Roanoke, Va.	R. C. Batchelor, Raleigh, N. C.

BEERS AND IMITATION BEERS—CONTINUED.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5205	2.25		None found	None found	
5206	1.80		do	do	
5207	1.75		do	do	
5231	1.55		do	do	
5232	1.75		do	do	
5240	2.90		do	do	
5282	2.04		do	do	
5284	1.75		do	do	
6043	0.00		Benzoates	do	Adulterated, misbranded.
6064	0.00	5.49	None found	do	
6070	1.80		do	do	
6109	1.60	3.96	do	do	Not properly labeled.
6090			do	do	do.
5597	0.00		do	Coal-tar dye	Imitation product, not properly labeled.
5599	0.08		do	None found	
5600	0.95		do	do	
5601	1.65		do	do	
5602	1.10		do	do	Not labeled.
5603	1.10		do	do	do.
5604	3.25		do	do	do.
5605	3.20		do	do	do.
5609	1.60		do	do	
5610	1.40		do	do	
5612	0.35		Benzoates	do	Adulterated.
5616	1.45		None found	do	
5617	1.20		do	do	
5618	1.70		do	do	
5619	1.70		do	do	
5624	0.35		Benzoates	do	Adulterated, misbranded.
5627	1.20		None found	do	
5628	1.50		do	do	
5629	1.75		do	do	
5630	1.70		do	do	
5435	1.50		do	do	
5502			do	do	Name rather misleading, is more like soda water than beer.
5554	3.05		do	do	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5555	Beer, Imitation, Extra Dry.	East Tennessee Brewing Co., Knoxville, Tenn.	W. C. Rector, Hendersonville, N. C.
5556	Beer, Imitation, No. 23	New South Brewing and Ice Co., Middlesboro, Ky.	do
5559	Beer, Imitation, Beerine	Pepsi-Cola Bottling Works, Tarboro, N. C.	Pepsi-Cola Bottling Works, Tarboro, N. C.
5561	Beer, Imitation, Reinbrau	Consumers Brewing Co., Norfolk, Va.	Jos. Allison, Raleigh, N. C.
5562	Beer, Imitation, Vim	Haynor Mfg. Co., Norfolk, Va.	S. Rhodes, Elizabeth City, N. C.
5563	Beer, Imitation, Extra Dry.	East Tennessee Brewing Co., Knoxville, Tenn.	N. A. Collins (Police), Asheville, N. C.
5566	Beer, Imitation, Mead	Pabst Brewing Co., Milwaukee, Wis.	S. T. Smith, Raleigh, N. C.
5567	Beer, Imitation, Schlitz Fizz.	Jos. Schlitz Brewing Co., Milwaukee, Wis.	John Fuller, Mt. Airy, N. C.
5568	Beer, Imitation, Beerine	Pepsi-Cola Bottling Works, Tarboro, N. C.	
5573	Beer, Imitation, Tidal Wave.	Rosenegk Brewing Co., Richmond, Va.	M. F. Caudle, Charlotte, N. C.
5575	Beer, Imitation, No. 23	New South Brewing Co., Middlesboro, Ky.	E. Dannenberg, Wilson, N. C.
5576	Beer, Imitation, Tidal Wave.	Rosenegk Brewing Co., Richmond, Va.	do
5577	Beer, Imitation, Cuban Ade.	Dannenberg Bros., Goldsboro, N. C.	J. E. Ramsey, Morganton, N. C.
5581	Beer, Imitation, Kola Malt.	Virginia Brewing Co., Roanoke, Va.	J. U. Smith, Raleigh, N. C.
5582	do	do	R. C. Batchelor, Raleigh, N. C.
5585	Beer, Imitation, No. 23	New South Brewing and Ice Co., Middlesboro, Ky.	Rocky Mount Pepsi-Cola Co., Rocky Mount, N. C.
5586	Beer	Home Brewing Co., Richmond, Va.	S. T. Smith, Raleigh, N. C.
5292	Beer, Imitation, Hopine	Consumers Brewing Co., Norfolk, Va.	National Drug Co., Wilson, N. C.
5321	Beer, Imitation, Cuban Ade.	Dannenberg Bros., Goldsboro, N. C.	L. H. Lee, Smithfield, N. C.
5322	Beer, Imitation, Crescent Ale.	Burr Mfg. Co., Richmond, Va.	Geo. T. Hudson, Edenton, N. C.
5323	Beer, Imitation, Tidal Wave,	Rosenegk Brewing Co., Richmond, Va.	F. R. Wilson, Raleigh, N. C.
5324	Beer, Imitation, Hop Brew.	Dannenberg Bottling Co., Goldsboro, N. C.	S. T. Smith, Raleigh, N. C.
5326	Beer, Imitation, Malto		W. F. Young, Princeton, N. C.
5328	Beer, Imitation, Tidal Wave.	Rosenegk Brewing Co., Richmond, Va.	F. R. Wilson, Raleigh, N. C.
5329	Beer, Imitation, Red Buck Ale.		J. B. Lowery, Elizabeth City, N. C.
5383	Beer, Imitation, No. 23	New South Brewing and Ice Co., Middlesboro, Ky.	L. M. McCormick (insp.), Asheville, N. C.
5384	Beer, Imitation, Extra Dry.	East Tennessee Brewing Co., Knoxville, Tenn.	do
5387	Beer, Imitation, G. B. S.	Darley Park Brewery, Baltimore, Md.	F. C. Turnage & Bro., Ayden, N. C.
5388	Beer, Imitation, Mead	Pabst Brewing Co., Milwaukee, Wis.	Armfield Co., Fayetteville, N. C.
5392	Beer, Imitation, Red Buck Ale.		J. T. Lamb & Co., Elizabeth City, N. C.
5416	do		Y. H. Byrum, Ayden, N. C.
5428	Beer, Imitation, Hop Brew.	Dannenberg Bottling Co., Goldsboro, N. C.	J. M. Arps, Plymouth, N. C.
5429	Beer, Imitation, Cuban Ade.	do	S. T. Smith, Raleigh, N. C.
5430	Beer, Imitation, Hop Brew.	do	do
5431	Beer, Imitation, Seaside	Consumers Brewing Co., Norfolk, Va.	Jas. Allison, Raleigh, N. C.

BEERS AND IMITATION BEERS—CONTINUED.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5555	1.30		None found	None found	
5556	0.60		do	do	
5559	0.65		do	do	Name rather misleading, is more like soda water than beer.
5561	1.90		do	do	
5562	4.10		do	do	
5563	1.40		do	do	
5566	1.50		do	do	
5567	2.20		do	do	
5568	0.35		do	do	Name rather misleading, is more like soda water than beer.
5573	1.95		do	do	
5575	0.60		do	do	
5576	1.90		do	do	
5577	0.85		do	do	
5581	0.55		do	do	
5582	0.60		do	do	
5585	0.15		do	do	
5586	3.60		do	do	
5292	2.48		do	do	Not labeled.
5321	1.59		do	do	
5322	2.16		do	do	
5323	1.90		do	do	
5324	1.05		do	do	
5326	4.15		do	do	Not properly labeled.
5328	1.90		do	do	
5329	1.97		do	do	Not properly labeled.
5383	0.25	11.92	do	do	
5384	2.45	2.35	do	do	
5387	4.95		do	do	
5388	1.65		do	do	
5392	1.90		do	do	Not properly labeled.
5416	1.97		do	do	do.
5428	1.67		do	do	
5429	1.50		do	do	
5430	1.67		do	do	
5431	2.15		do	do	

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5432	Beer, Imitation, Kola Malt.	Virginia Brewing Co., Roanoke, Va.	R. C. Batchelor, Raleigh, N. C.
5434	Beer, Imitation, Vim	Haynor Mfg. Co., Norfolk, Va.	Matthews & Hampton, Raleigh, N. C.
6093	Beer, Imitation, Beerine	Maxstockline	Crown Bottling Works, New Bern, N. C.
6110	Beer, Imitation, Schlitz Fizz.	Jos. Schlitz Brewing Co., Milwaukee, Wis.	W. E. Springer, Wilmington, N. C.
6111	Beer, Imitation, Lagerine	do	do
6112	Beer, Imitation, Ambrine	Robert Portner Brewing Co., Alexandria, Va.	do
6114	Beer, Imitation, Hop Beverage.	Home Brewing Co., Richmond, Va.	E. Dannenberg, Wilson, N. C.
5309	do	do	Percy Holt, Wilson's Mills, N. C.
5578	Extract Dusselldorf's Malt.	Dusselldorf Extract Co., Germany.	J. E. Ramsey, Morganton, N. C.
5192	Beer, Vim	Haynor Mfg. Co., Norfolk, Va.	A. L. Eakir, Durham, N. C.
5193	Ale, Crescent	Burr Mfg. Co., Richmond, Va.	E. B. Jackson, Plymouth, N. C.

DISTILLED LIQUORS.

Brandy and whiskey are the most important of this class of products, and whiskey, being of the greatest commercial importance, is the principal subject of this examination.

In beginning an investigation of whiskey the question naturally arises, What is whiskey and what are the normal constituents and the proportions in a pure whiskey? It is generally supposed that these things are well understood, but that is not the case. No subject has received less attention at the hands of chemists than distilled liquors. It seems rather strange that a product of so much commercial importance, and whose origin is lost in antiquity, should have had so little attention from chemists. Among the leading recent investigators of this subject are Shepard, Ladd, Crampton and Tolman. They have recently obtained a great deal of valuable information in regard to whiskey, and have disproven much that was formerly thought to be true of it.

Webster's Dictionary defines whiskey as "an intoxicating liquor distilled from fermented grain, potatoes," etc. The United States Pharmacopœia defines it as "an alcoholic liquor obtained by the distillation of a mash of fermented grain, usually a mixture of corn, wheat and rye, and at least four years old."

Distilled spirits corresponding closely to whiskey were known to the Egyptians in very early ages. When the English invaded Ireland they found the manufacture of whiskey a fairly well-understood art. Malted barley alone was then used in the manufacture of whiskey, and the small or pot still was employed in its distillation.

Whiskey is now largely made from fermented grain, but potatoes, etc., are also used. In some cases the grain is malted, but the raw grain is more often

BEERS AND IMITATION BEERS—Continued.

Laboratory Number.	Alcohol—Per Cent by Volume.	Solid Matter in Solution—Per Cent.	Adulterants.		Remarks and Conclusions.
			Preservatives.	Coloring Matter.	
5432	3.08		None found	None found	
5434	4.03		do	do	
6093			do	do	Not properly labeled; name rather misleading, is more like soda water than beer.
6110	1.70	4.72	do	do	
6111	0.40	5.43	do	do	
6112	1.40	4.54	do	do	
6114	0.65		do	do	
5309	1.60		do	do	
5578	3.75		do	do	
5192	3.40	3.75	do	do	
5193	3.25	5.99	do	do	

used. When the unmalted grain is used, the first distillation produces a crude product, which is redistilled; but when the malted grain has been used, small stills are employed and the product is not redistilled.

There are other methods of manufacture which are recognized in this country, the products of which we find upon the market. This process of manufacturing has been known as blending or rectifying. The whiskeys found on the market may be classified as follows:

1. Whiskey manufactured wholly by the distiller, under the supervision of the Government. This whiskey is matured or aged in wood, and leaves the Government warehouse bearing two stamps—one, that of the warehouse, and the other a tax stamp. This is known as a straight whiskey and may be bottled while in the Government warehouse and sealed by a Government stamp, when it is said to be bottled in bond.

2. Blended whiskeys are made by taking two or more whiskeys of the first class and blending them in such proportions that certain properties may be developed. Since the Food Laws prevent a product composed of whiskey and dilute silent spirit colored with caramel being sold as blended whiskey, the manufacturers blend old and new whiskeys.

3. A large class of whiskey is made by adding whiskey of the first class to dilute silent spirit. Usually caramel is added to restore the color lost by the addition of the spirit. In this way the volume of whiskey of the first class used is increased to several times its original quantity. As the silent spirit has but little flavor, the flavor of this class of whiskey is largely that of the original whiskey of the first class used in the manufacture, though, of course, not so pronounced. As the original whiskey is mixed with silent spirit, this process of manufacture has formerly been known as blending, but as the Food Law provides that a blend is a mixture of like substances, and as silent spirit

is not whiskey, a product made from whiskey and silent spirit cannot now be classed as a blended whiskey. The process is also called rectifying, as the manufacturer has a rectifier's license and uses rectified spirits. It can be classed as a compound whiskey, provided that it contains enough whiskey to make it a real compound and not a mere semblance of one. On the advice of the Attorney-General, the Secretary of Agriculture of the United States has ruled that to be lawfully labeled "Compound Whiskey" the amount of whiskey in a mixture of whiskey and silent spirit must equal or exceed one-third in volume of the product.

4. A fourth class of whiskey on the market is a product that is wholly artificial. It is made by adding coloring matter, beading oil and various essences for flavoring to dilute silent spirit. This class of whiskey was formerly classified by the manufacturer as a blended or rectified whiskey. As it is wholly an artificial product, it appears to have no right to be so called, and must be labeled "Imitation or Artificial Whiskey."

From the foregoing it is very evident that the term "whiskey," as it has generally been used, referred to quite a variety of products, necessarily varying in composition.

The United States Circuit Court at Baltimore, in a case where a product labeled "Whiskey" was seized, held that whiskey was one of the distillates from the fermented mash of sound grain, distilled so as to contain the volatile flavors, together with ethyl alcohol derived from the grain during fermentation, and stored in wood not less than four years.

The definition of "whiskey" is simple, but it is a very complex liquid. In addition to about 45 to 50 per cent by volume of ethyl alcohol and 50 to 55 per cent of water, it contains a number of other substances. Of these substances Allen (Analyst, June, 1901) says: "The secondary constituents of spirits are by no means to be regarded in the light of impurities, as they have wrongly been called and considered by some. They are the associated bodies which give the alcohol its special and valued characteristics, and to their production, modification or elimination by age we owe the change which spirits undergo during the process of maturing."

It is well known that new whiskey is harsh, unpalatable and not fit for use. The Government controls bonded warehouses where whiskey is stored during maturation. It is stored in charred barrels, and it was formerly believed that during this storage the fusel oil, or higher alcohols, were either absorbed, eliminated or so changed by oxidation or otherwise that the whiskey lost its harsh, unpalatable flavor. Professor Shepard, of the Food and Dairy Commission of South Dakota, says that the above theory is entirely wrong—that the percentage of these alcohols increases by aging instead of decreases. The results recently obtained by the leading investigators of the subject tend to show that Professor Shepard is correct in his statement regarding the effect of aging of whiskey on the fusel oil present.

The raw, harsh taste of new whiskey is attributed by some good authority to the presence of pyrrol, some alkaline and sulphur compounds and phenolic bodies. The pyrrol is supposed to resinify and the others are unstable and are oxidized during the process of aging or maturing.

It is evident that very marked changes take place in distilled liquors on the properly aging or maturing of them, but, with our present knowledge of the subject, it is safe to say that we do not know for certain what those changes are.

What has been said of whiskey is largely true of brandy, except that the latter is made from fermented fruit juice instead of cereal products.

Samples Examined.—Under this head, samples were examined as follows: Whiskey, 26; brandy, 3; gin, 1.

Of the twenty-six samples of whiskey examined, five were straight whiskeys, properly aged; five were corn whiskeys, partially but not properly aged; five were new corn whiskeys, not aged at all; two were blends of old and new whiskeys; six were compound whiskeys, and three were imitation whiskeys.

Of the three samples which were labeled and sold as brandy, one proved to be an apple brandy, and two, No. 5269 (Peach and Honey) and No. 5270 (Blackberry Brandy) were not brandies in any sense, but were imitation cordials, adulterated with coal-tar dye.

One sample of gin was examined, and, while it was made from silent spirit, no adulteration was found.

In these samples the amount of alcohol, solid matter in solution, total acidity, esters and fusel oil present was determined. Qualitative tests for tannin, coloring matter, etc., were made. The results of the examination are printed in the table below.

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5251	Whiskey, Rye, Sunny Brook	Sunny Brook Distilling Co., Jefferson Co., Ky.	Frank Hurley, Winston, N. C.
5252	Whiskey, Corn	Winston Distributing Co., Winston, N. C.	do
5253	Whiskey, Rye, Compound	do	do
5254	Whiskey, Corn	D. L. Arey, Salisbury, N. C.	M. Kobre, Winston, N. C.
5255	Whiskey, Corn, Blend	Winston Distributing Co., Winston, N. C.	do
5256	Brandy, Apple	Z. T. Fletcher, Wilkesboro, N. C.	do
5257	Whiskey, Rye, Blend	Straus, Gunst & Co., Richmond, Va.	do
5258	Whiskey, Corn, Silver Springs	J. W. Kelly & Co., Chattanooga, Tenn.	do
5259	Whiskey, Rye, Blend, Yellow Table.	Chas. M. Pfeifer & Co., Cincinnati, Ohio.	do
5260	Whiskey, Corn, Compound	Racard & Goldsborough, Baltimore, Md.	Holleman & Herring, Winston, N. C.
5261	Whiskey, Rye, Blend	Straus, Gunst & Co., Richmond, Va.	do
5262	Whiskey, Corn, Catawba Valley	R. H. Bennett & Co., Marion, N. C.	do
5263	Gin, Red Lion, Courage	Mallard Distilling Co., New York, N. Y.	do
5264	Whiskey, Corn	Winston Distributing Co., Winston, N. C.	do
5265	Whiskey, Rye, Blend, Belle of Virginia.	J. & E. Mahoney, Portsmouth, Va.	do
5266	Whiskey, Rye, Green River	Green River Distilling Co., Owensboro, Ky.	A. W. Jones, Winston, N. C.
5268	Whiskey, Rye, Blend	Straus, Gunst & Co., Richmond, Va.	Shermer & Phillips, Winston, N. C.
5269	Brandy, Peach and Honey	do	do
5270	Brandy, Blackberry	do	do
5271	Whiskey, Corn	Bailey Distilling Co., Danville, Va.	do
5272	do	Straus, Gunst & Co., Richmond, Va.	do
5273	Whiskey, Corn, Bailey's Handmade Compound.	Bailey Distilling Co., Danville, Va.	do
5276	Whiskey, Rye, Mellwood	Mellwood Distilling Co., Louisville, Ky.	do
5277	Whiskey, Rye, Old Taylor	E. H. Taylor, Jr., & Co., Frankfort, Ky.	T. K. Renigar, Winston, N. C.
5278	Whiskey, Rye, Old Overholt	A. Overholt & Co., Pittsburg, Pa.	do
5319	Whiskey, Corn, Old Eagle	Winston Distributing Co., Winston, N. C.	Frank Hurley, Winston, N. C.
5320	Whiskey, Corn	Straus, Gunst & Co., Richmond, Va.	do
5389	Whiskey, Corn, Bailey's Sweet Mash, Compound.	Bailey Distilling Co., Danville, Va.	Holbrook & McCann, Winston, N. C.
6141	Whiskey, Rye, Blend, Jefferson Club.	Straus, Gunst & Co., Richmond, Va.	
6142	Whiskey, Rye, Blend, Old Henry.	do	

DISTILLED LIQUORS.

Laboratory Number.	Grams in 100 c.c.								Remarks and Conclusions.
	Alcohol—Per Cent by Volume.	Proof.	Solid Matter in Solution.	Total Acidity—Acetic.	Esters.	Fusel Oil—Per Cent by Volume.	Tannin.	Coloring.	
5251	50.45	100.00	.141	.1031	.0736	.2328	Present	Natural	Straight whiskey, properly aged.
5252	44.40	88.10	.010	.0315	.0345	.0630		Colorless	New corn whiskey, not aged.
5253	35.40	70.20	.220	.0125	.0033	.0540		Caramel	Imitation whiskey.
5254	51.00	101.19	.010	.0514	.0591	.1748		Colorless	New corn whiskey, not aged.
5255	34.42	68.30	.010	.0315	.0537	.0730		do	do.
5256	48.06	95.30	.010	.0836	.0758	.1785		Natural	New apple brandy.
5257	42.89	85.10	.761	.0282	.0276	.0210		Natural and caramel.	Compound whiskey.
5258	46.43	92.10	.280	.0815	.0715	.2082		Caramel, small amount.	Corn whiskey, not properly aged.
5259	44.96	89.20	.360	.0488	.0065	.0541	Trace	do	Compound whiskey.
5260	35.11	69.70	.040	.0284	.0068	.0960	Trace	Caramel, small amount.	do.
5261	40.32	80.00				.0018		Caramel	Imitation whiskey.
5262	48.73	96.71	.720	.0816	.0715	.2065	Trace	Caramel, small amount.	Corn whiskey, not properly aged.
5263	39.11	77.60	2.0475	.0020	.0211	None		Colorless	Gin, prepared from neutral spirits.
5264	40.32	80.00	.010	.0315	.0341	.0640		do	New corn whiskey, not aged.
5265	44.10	87.50	.284	.0583	.0284	.0911	Trace	Caramel	Compound whiskey.
5266	50.60	100.40	.160	.1030	.0743	.2568	Present	Natural	Straight whiskey, properly aged.
5268	45.46	70.20	.276	.0151	.0190	Trace		Caramel	Imitation whiskey.
5269	18.35		16.526					Coal-tar dye	Misbranded, not a brandy.
5270	10.49	20.80	25.66	.0350	.0390	.0184		do	Misbranded, not a brandy, but imitation cordial.
5271	46.18	91.60	.090	.0744	.0520	.1985	Trace	Caramel, small amount.	Corn whiskey, not properly aged.
5272	51.70	102.60	.290	.0843	.0735	.1625	Trace	do	do.
5273	46.45	92.20	.300	.0432	.0206	.0910	Trace	do	Compound whiskey.
5276	50.70	100.60	.170	.0849	.0728	.2458	Present	Natural	Straight whiskey, properly aged.
5277	50.60	100.39	.120	.0740	.0582	.1896	do	do	do.
5278	49.65	98.50	.160	.0941	.0858	.1976	do	do	do.
5319	44.25	87.80	1.516	.0340	.0435	.0970	Trace	Caramel, small amount.	Corn whiskey, partially aged.
5320	44.80	88.90	.654	.0826	.0398	.0620	do	do	New corn whiskey, not aged.
5389	44.45	92.00	.300	.0339	.0280	.1260	do	do	Compound whiskey, corn.
5441	49.90	99.50	.184	.0828		.1633	Present	Caramel and natural.	Whiskey, blend, new and old.
5442	49.95	99.60	.182	.0845		.1642	do	do	do.

TONICS.

Three samples were examined. The amount of alcohol in them was deter-

RESULTS OF THE DETERMINATION OF ALCOHOL

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5233	Blood Tonic, Cinery Americal.	Dr. D. M. McCanless, Asheville, N. C.	R. O. Patterson, Asheville, N. C.
5236	Walker's Tonic	The E. E. Sutherland Medicine Co., Paducah, Ky.	J. W. Evans, Kittrell, N. C.
5290	Mullein, Horehound and Glycerine Tonic.	H. M. Smith, Durham, N. C.	

ARTIFICIAL SWEETENERS.

A few substances other than sugar are sweet to the taste. Only one of them, however (saccharine), is used to any extent as a substitute for sugar. Saccharine is from 350 to 500 times sweeter than sugar, and is right largely used as a substitute for that product, though its taste is the only relation that

RESULTS OF THE EXAMINATION

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5625	Crest Garantose	Heyden Chemical Works, Garfield, N. J.
5859	Sugarine	Manners & Laver, New York, N. Y.
5860	Power	Blumenthall Bros., Philadelphia, Pa.
5861	Intensac	Liquid Carbonic Co., New York, N. Y.
4528	Henden Sugar	

COLORING MATTERS.

Many soda-water bottlers and other food manufacturers use artificial coloring in their products. The colors are usually bought for vegetable substances.

RESULTS OF THE EXAMINATION OF COLOR

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5202	Coloring, Strawberry	Alford, Rosenfelt & Co., Cincinnati, Ohio
6072	Coloring	
6113	----do	W. H. Hutchinson & Son

mined, and they were tested for chemical preservatives, but no effort was made to determine or even detect any medicinal constituent.

AND EXAMINATION FOR PRESERVATIVES IN TONICS.

Laboratory Number.	Alcohol—Per Cent by Volume.	Adulterants—Chemical Preservatives.	Remarks.
5233	11.57	None found	No effort was made to determine or even detect the medicinal properties.
5236	17.65	do	do.
5290		do	do.

it bears to sugar, for it is not a food at all. As sugar is a food and as saccharine is not, when it is used in food as a substitute for sugar its presence should be made known to the purchaser, or it will probably be misleading.

Saccharine is often sold under trade or proprietary names as a substitute for sugar. Five such products have been examined under this head, and all proved to be composed of saccharine, or at least largely so.

OF ARTIFICIAL SWEETENERS.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Remarks and Conclusions.
5625	Crescent Carbonating Co., Hendersonville, N. C.	Saccharine.
5859	J. R. Cobb's Bottling Co., Brevard, N. C.	do.
5860	L. T. Holmes & Co., Waynesville, N. C.	do.
5861	Groves & Perry, Asheville, N. C.	do.
4528	Koca Nola Bottling Works, Gastonia, N. C.	do.

but are mostly coal-tar dyes.

Twelve samples of such coloring matters were examined. They all proved to be coal-tar dyes except one, which was caramel.

ING MATTERS USED IN FOOD AND BEVERAGES.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Remarks and Conclusions.
5202	C. Valaer Bottling Works, Charlotte, N. C.	Coal-tar dye.
6072	S. T. Boon, Fayetteville, N. C.	do.
6113	Coca-Cola Bottling Co., Salisbury, N. C.	do.

RESULTS OF THE EXAMINATION OF COLORING

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.
5506	Coloring	Scales-Wilson Co., Greenville, S. C.
5507	Coloring, Red	do
5508	Coloring, Vegetable Red	
5986	Coloring, Red	Blumenthall Bros., Philadelphia, Pa.
5987	Coloring, Green	Scales-Wilson Co., Greenville, S. C.
5988	Coloring, Peach	do
5989	Coloring, Red	do
6078	Coloring, Strawberry	S. T. Mitchell Co., Philadelphia, Pa.
6079	Coloring, Peach	Blumenthall Bros., Philadelphia, Pa.

PRESERVATIVES SOLD UNDER TRADE OR PROPRIETARY NAMES.

With the exception of catsups and sauces, the State Food Law prohibits the use of chemical preservatives in food products offered for sale in North Carolina.

Preservatives, the use of which in food offered for sale in this State is a violation of the law, are offered to the public under trade or proprietary

RESULTS OF THE EXAMINATION OF PATENT OR PROPRIETARY BEVERAGE IS A VIOLA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5592	Frostine		L. M. McCormick, Inspector, Asheville, N. C.
5990	Sure Keep Fruit Powders	Vaughn-Crutchfield Co., Winston, N. C.	G. W. Miller, Lexington, N. C.
5991	Scott's Fruit Powders	John M. Scott & Co., Charlotte, N. C.	Dave Bost Co., Concord, N. C.

RESULTS OF THE EXAMINATION OF PATENT OR PROPRIETARY BEVERAGE IS NOT A VIOLA

Laboratory Number.	Material and Brand from Label.	Manufacturer or Wholesaler.	Retail Dealer or Party Who Sent Sample for Analysis.
5614	Freeze-Em	B. Heller & Co., Chicago, Ill.	L. M. McCormick, Inspector, Asheville, N. C.

MATTERS USED IN FOOD AND BEVERAGES—CONTINUED.

Laboratory Number.	Retail Dealer or Party Who Sent Sample for Analysis.	Remarks and Conclusions.
5506	Crown Carbonating Co., Hamlet, N. C.	Caramel.
5507	----do	Coal-tar dye.
5508	Coca-Cola Bottling Works, Fayetteville, N. C.	do.
5986	Steam Bottling Works, Greensboro, N. C.	do.
5987	J. R. Cobb Bottling Co., Brevard, N. C.	do.
5988	----do	do.
5989	----do	do.
6078	Acme Bottling Works, Kinston, N. C.	do.
6079	----do	do.

names. The names under which they are sold do not indicate their composition or that they contain a chemical preservative.

Under preservatives, four samples were examined. One, No. 5572, was composed of sodium sulphite and salt; two, Nos. 5990 and 5991, were composed of salicylic acid. The sale of food containing any of these three products is a violation of the law.

CHEMICAL PRESERVATIVES, THE USE OF WHICH IN FOOD OR
TION OF THE FOOD LAW.

Laboratory Number.	Claims Made by Manufacturers Regarding Their Proprietary Preservatives.	Composed Principally of
5592		Sodium sulphite and common salt.
5990	Powders absolutely pure and perfectly harmless.	Salicylic acid.
5991	Perfectly harmless	do.

CHEMICAL PRESERVATIVES, THE USE OF WHICH IN FOOD OR
TION OF THE FOOD LAW.

Laboratory Number.	Claims Made by Manufacturers Regarding Their Proprietary Preservatives.	Composed Principally of
5614		Saltpeter and common salt.

SIXTH REPORT ON CONCENTRATED FEEDING STUFFS AND COTTON-SEED MEAL.

B. W. KILGORE, STATE CHEMIST.

BY C. D. HARRIS (FEED CHEMIST AND MICROSCOPIST IN CHARGE OF INSPECTION AND ANALYSIS OF FEEDS)

AND

L. L. BRINKLEY AND DR. J. M. PICKEL.

Since the publication of the last Bulletin on Concentrated Feeding Stuffs 497 samples of feeds and cotton-seed meals have been examined. The number of samples of each kind is as follows:

Wheat Bran and Mixed Brans	51
Middlings, or Shorts	50
Brans and Shorts	15
Shipstuff	47
Corn and Oat Feeds	12
Rice Feeds	7
Molasses Feeds	13
Beet Pulp	2
Hominy Feeds and Chops	14
Cotton-seed Feeds	3
Special Mixed Feeds	18
Miscellaneous Feeds	88
Miscellaneous Feeds examined microscopically	108
Cotton-seed Meals	55
Cracked Corn	14
Total	497

DUTY OF THE DEPARTMENT OF AGRICULTURE.

It is the duty of the Department of Agriculture to see that all feeds are properly marked, to collect and examine them in order to note whether they are as represented, and to publish the results for the benefit of all interested parties.

The Department also analyzes free any sample of feeding stuff sent in.

The Department stands ready, through correspondence and through the personal services of its regular inspectors, to furnish whatever information it may possess concerning the character and nutritive value of all feed stuffs.

STANDARDS ADOPTED.

As the present law requires that every bag must have a guaranteed analysis attached, and gives the Department the right to adopt standards for the dif-

ferent feeds, the following standards have been adopted. For Pure Wheat Bran, Pure Wheat Shorts, and Pure Wheat Bran and Shorts mixed:

	Protein.	Fat.	Crude Fiber.
Wheat Bran	14.5	4.00	9.5
Middlings	15.00	4.00	6.00
Bran and Shorts	14.5	4.00	8.00

Standards for the other feeds will be adopted as soon as this Department has had time to accumulate enough information and analyses to justify it in adopting standards that will be fair to both manufacturers and consumers.

ENFORCEMENT OF THE FEED LAW.

North Carolina was the first Southern State to pass a feeding-stuff law. This law went into effect July 1, 1903, and the first bulletin giving the results of the inspections and analyses of feeds found on the North Carolina markets was published in December, 1903. This bulletin revealed the fact that concentrated feeding stuffs were more largely adulterated than commercial fertilizers prior to the passage of the fertilizer law. The State was flooded with low-grade, misbranded and adulterated feeds. Such materials as rice chaff, ground corn cobs, peanut hulls and oat hulls, which have very little, if any, feeding value, were used extensively in the composition of feeds. There was nothing on the bag to indicate their presence. This Department realized the gravity of the situation and set to work under the feed law to force from the markets of this State all low-grade, misbranded and adulterated feeds. For the past five years frequent inspections have been made each year in all parts of the State, and every year the quality of feeds has increased. Consumers of feeds are now enjoying the benefits derived from a strict enforcement of the feed law and are being protected from unscrupulous manufacturers, mixers and manipulators.

This bulletin shows the results of five years' enforcement of the feed law, and, while there are still some misbranded and adulterated feeds offered at times during the year, their sale is very limited.

PRICES OF FEEDS.

The prices of feeds have never been higher than they are to-day. Therefore, to buy the best feed at the least cost is the problem confronting buyers. This problem can be solved to a great extent by using a little judgment in the selection of different feeds.

There is but one way to judge the merits of different feeds, and that is by comparing the per cents of protein, fat and fiber they contain with the price. Purchasers should compare the per cents of protein and fat of different feeds with the prices, and if the prices are about the same they should select the feed containing the highest per cent of protein and fat. By doing this the buyer will find many times that he will get from three to ten times as much protein and fat in one feed as in another for the same price.

DUTY OF FEED DEALERS.

Every feed dealer, to protect himself, should insist on feeds being shipped him in strict compliance with the law. If he will do this, and not buy from those manufacturers who do not comply with the law, he will be saved considerable trouble and inconvenience by having his feeds seized and confiscated by feed inspectors.

SERIOUS ADULTERATION.

The Capital Grain and Mill Company, of Nashville, Tenn., placed upon the markets of this State during the year two feeds—one branded "Mixed Bran Feed," the other "Mixed Middling Feed." The composition of these feeds was about the same. These two products were seriously adulterated with finely ground corn cobs, and were seized whenever found and their sale prohibited. They were guaranteed to contain thirteen (13) per cent protein, and only one sample ran as high as 10 per cent protein. Such mixtures cannot be offered for sale in this State.

MUELLER'S MOLASSES GRAINS.

Mueller's Molasses Grains are guaranteed to contain 19.88 per cent protein and 2.73 per cent fat. Four samples were analyzed. One sample contained 6.00 per cent protein, another 8.75 per cent protein, another 10.00 per cent protein, and a fourth sample 13.88 per cent protein. The composition of Mueller's Molasses Grains seems to differ with each shipment, and no attempt is evident to make the product uniform. Molasses is used in this feed to cover up the low grade and inferior materials used in its composition. Such mixtures, whenever offered for sale in this State, will be seized and confiscated and the manufacturer prosecuted.

FACTS OF INTEREST CONCERNING SOME FEEDS.

Corn Cobs.—Corn cobs are being very finely ground and called cob meal. This product is used as adulterant in many finely ground feeds, and its detection is difficult, except with a microscope. When the whole ear of corn and the cob are ground together, the product being corn and cob meal, this is a good, legitimate feed; but when cobs are found in other products they are put in them to cheapen the cost of the feed to the manufacturer and are sold at a price much in excess of their value. In fact, their value as a feed, except in corn and cob meal, is very low indeed.

Molasses Feeds.—Some of these are good feeds, and the molasses used in them has a legitimate use, but in many of them the molasses is used to mask the adulterants, such as rice chaff, ground weed stalks and weed seeds. A molasses feed was found containing rice chaff, in which it was impossible to detect the rice chaff present without first thoroughly drying the sample and then putting it under a magnifying glass. Molasses is a carbohydrate and can be used in feeds to good advantage, but has been brought into disrepute by being used by unscrupulous manufacturers to mask adulterants.

Cracked Corn.—Much of the cracked corn that has been coming into the State lately has been made from damaged corn—so much so that now all cracked corn made from damaged corn must be branded and sold as Damaged Cracked Corn or Cracked Corn made from damaged corn.

Corn and Oat Feeds.—These feeds are perhaps the lowest-grade feeds on our market. They are certainly the most expensive. Most of them are composed of oat hulls and possibly enough cracked corn to make the intending purchaser think they are much better feeds than they really are. This Department has been accumulating evidence and analyses concerning these feeds for the past several years, and feels justified now in making a standard analysis

for these products. Under this standard the per cent of oat hulls in these feeds will be greatly reduced, and consequently the quality of these feeds improved.

*Rice Products.**—A good rice bran should contain 12.50 per cent protein, 10.00 per cent fat, not over 10.00 per cent fiber and not over 9.00 per cent ash, and should not have a rancid odor. According to Dr. Brown, formerly chemist of the Louisiana Experiment Station, who made extensive investigations on rice products, the formula used for calculating adulteration in rice bran with hulls is as follows: Per cent hulls = 3.33 × (per cent fiber = 10), assuming that the hulls carry 40.00 per cent fiber and the bran runs 10.00 per cent fiber.

A sample of rice bran with 30.00 per cent fiber would be considered as having 66.60 per cent hulls. Example: Per cent hulls equals 3.33 × (30—10) = 20 3.33 × 20 = 66.60 per cent.

Alfalfa Feeds.—Alfalfa used as a feed is that part of the plant that grows above ground. When properly cured it makes a good hay. Alfalfa meal is the same as alfalfa hay, except that it is finely ground. Both have the same nutritive value and are worth about the same price for feeding purposes. Alfalfa has about the same feeding value as pea pines. Alfalfa meal is being used in many feed mixtures to bring up the per cent of protein and make the feed more palatable.

Weed Seeds.—Many feeds contain large quantities of different kinds of weed seeds, added as an adulterant. One feed widely advertised and sold in Maine was found to be made up of from 20 to 60 kinds of weed seeds. A germination test showed that this feed would produce at the rate of about 2,000,000 noxious plants for each 100-pound bag of the feed.

Coloring Feeds.—The prices of feeds have advanced so much that the coloring process has commenced. Low-grade and inferior feeds, by the use of coloring agents, are made to look fresh and green, and now when we see a nice, bright-colored feed we don't know whether it is the natural color of the product or a worthless imitation artificially colored.

Free Acid.—In the manufacture of gluten feeds, through carelessness enough free acid has been left in some of them to make their use as a feed dangerous.

ANALYSES OF SAMPLES OF CONCENTRATED FEEDING STUFFS, SEASON 1908.

On the following pages will be found the results of the chemical and microscopic examinations of the samples of concentrated stock feeds collected by the inspectors of the Department, and those sent in by farmers, dealers and manufacturers. These analyses, with the discussion of the results which follow them, are deserving of careful consideration on the part of all local dealers and also feeders.

---

*Georgia Department of Agriculture.

WHEAT BRAN.

Wheat bran is the by-product from the manufacture of flour. It carries a considerable amount of crude fiber, somewhat resembling straw in this par-

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2657	Bran	Acme Mills and Elevator Co., Hopkinsville, Ky.	B. F. Mitchell & Co., Wilmington, N. C.	Mar. 17, '08
2653	----do	----do	John S. McEachern, Wilmington, N. C.	Mar. 17, '08
2690	----do	Adams Grain and Provision Co., Fayetteville, N. C.	Adams Grain and Provision Co., Fayetteville, N. C.	April 20, '08
2867	Mixed Bran	Asheville Milling Co., Asheville, N. C.	T. B. Crary, Brevard, N. C.	July 22, '08
2885	----do	----do	R. L. McConnaughy, Morganton, N. C.	Aug. 11, '08
2723	Bran	----do	Carolina Feed Store, Raleigh, N. C.	June 20, '08
2617	----do	----do	J. B. Schochett, Asheville, N. C.	Feb. 13, '08
2616	----do	----do	Asheville Grocery Co., Asheville, N. C.	Feb. 13, '08
2611	Mixed Bran	----do	J. H. Pearson, Morganton, N. C.	Feb. 13, '08
2766	Wheat Bran	----do	----------	----------
2686	Bran	Atlanta Milling Co., Atlanta, Ga.	A. E. Rankin & Co., Fayetteville, N. C.	April 20, '08
2841	Wheat Bran	----do	J. H. Dellinger, Shelby, N. C.	July 15, '08
2772	Bran	Ballard & Ballard, Louisville, Ky.	Burrus & Gray, New Bern, N. C.	July 11, '08
1967	----do	Carolina Roller Mills, Durham, N. C.	----------	----------
2892	----do	Chilhowie Milling Co., Chilhowie, Va.	----------	----------
2822	----do	H. C. Cole Milling Co., Chester, Ill.	----------	----------
2645	----do	Concord Milling Co., Concord, N. C.	----------	----------
1989	----do	Crown Milling Co., Ashboro, N. C.	C. L. Cranford, Ashboro, N. C.	Feb. 7, '08
1980	----do	Dan Valley Mills, Danville, Va.	Tucker & Irwin, Greensboro, N. C.	Feb. 6, '08
2721	----do	The Dunlop Milling Co., Clarksville, Tenn.	J. P. Wyatt & Son, Raleigh, N. C.	June 30, '08
1976	Wheat Bran	----do	The Patterson Co., Greensboro, N. C.	Feb. 6, '08
2793	Bran	----do	Elmere-Maxwell Co., Greensboro, N. C.	July 6, '08
2769	----do	Dunlop Mills, Richmond, Va.	Edwards & Pegram, Kinston, N. C.	July 10, '08
1909	----do	Eagle Flouring Mill, Sweetwater, Tenn.	----------	----------
2752	Mixed Bran	Forsyth Roller Mills, Winston-Salem, N. C.	Forsyth Mills, Winston, N. C.	July 1, '08
2628	Bran	----do	Farmers Supply Co., Winston, N. C.	Feb. 24, '08
2880	----do	Glen Alpine Milling Co., Glen Alpine, N. C.	Green & Kincaid, Morganton, N. C.	Aug. 11, '08
2875	----do	----do	----------	----------
2730	----do	Harrisonburg Milling Co., Harrisonburg, Va.	Hunter & Dunn, Raleigh, N. C.	June 30, '08
2889	----do	Horne-Johnstone Co., Mocksville, N. C.	J. L. Cowan, Statesville, N. C.	Aug. 14, '08
2806	Wheat Bran	----do	Kluttz & Rendleman, Salisbury, N. C.	July 8, '08
1999	Bran	----do	Adams Grain and Provision Co., Charlotte, N. C.	Feb. 11, '08

ticular. It differs from straw, however, in that the inner surface of the bran flakes is made up of the nutritious layer of the wheat grain, which is rich in protein and fat. To be of good quality it should contain 15½ per cent protein.

OF WHEAT BRAN AND MIXED BRANS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2657	100	16.00	4.68	7.49	------	16.63	4.92	7.12	------	Wheat product.
2653	100	16.00	4.68	7.49	------	16.00	4.53	7.40	------	do.
2690	------	------	------	------	------	14.88	3.22	7.95	------	do.
2867	80	13.00	3.00	9.50	------	12.63	3.71	5.22	------	Wheat and corn bran.
2885	80	13.00	3.00	9.50	------	13.63	4.20	5.77	------	do.
2723	80	14.50	4.00	9.50	------	14.62	3.98	7.67	------	Wheat bran and corn bran.
2617	------	------	------	------	------	14.00	4.05	8.07	------	do.
2616	------	------	------	------	------	15.25	4.10	8.15	------	do.
2611	80	13.00	3.00	9.50	------	16.13	5.52	8.15	------	do.
2766	------	------	------	------	------	14.63	3.27	6.87	------	Wheat and corn product.
2686	100	14.50	4.00	9.50	------	15.00	4.69	8.12	------	Wheat product.
2841	80	14.50	4.00	9.50	------	15.13	3.99	6.30	------	do.
2772	100	15.25	4.60	9.08	------	14.88	4.53	7.95	------	do.
1967	------	------	------	------	------	16.87	3.91	8.30	------	do.
2892	------	------	------	------	------	14.50	4.00	9.50	------	do.
2822	------	------	------	------	------	15.00	4.48	9.50	------	do.
2645	------	------	------	------	------	15.63	4.27	9.05	------	do.
1989	80	15.50	4.00	8.60	------	14.62	4.02	8.75	------	do.
1980	100	14.50	4.00	9.50	------	14.63	4.37	9.10	------	do.
2721	100	14.50	4.06	9.49	------	14.00	3.78	8.82	------	do.
1976	100	14.60	3.82	9.49	------	17.25	4.44	9.20	------	do.
2793	100	14.60	4.06	9.49	------	13.88	4.41	8.42	------	do.
2769	100	14.50	4.00	9.50	------	14.63	5.01	7.17	------	do.
1909	------	------	------	------	------	14.87	3.98	9.17	------	do.
2752	------	14.00	4.00	11.00	------	13.75	4.99	8.95	------	Wheat and corn bran.
2628	100	14.00	4.00	11.00	------	14.50	3.97	9.50	------	Wheat bran and corn bran.
2880	------	------	------	------	------	15.62	3.62	7.75	------	Wheat product.
2875	------	------	------	------	------	14.13	3.67	9.05	------	do.
2730	100	17.25	4.61	10.70	------	14.00	3.24	7.85	------	do.
2889	100	14.75	4.25	6.00	------	14.00	------	8.30	------	do.
2806	100	14.75	4.38	6.14	------	14.38	3.76	8.55	------	do.
1999	100	14.75	4.38	6.14	------	------	4.35	8.30	------	do.

RESULTS OF THE EXAMINATION OF WHEAT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
1995	Bran	Horne-Johnstone Co., Mocksville, N. C.	Kluttz & Rendleman, Salisbury, N. C.	Feb. 8, '08
2760	----do	J. M. Koiner, Grottoes, Va.	H. Schafer, Mount Airy, N. C.	July 3, '08
2656	----do	Liberty Mills, Nashville, Tenn.	J. W. Brooks, Wilmington, N. C.	Mar. 17, '08
1960	----do	Liberty Milling Co., Liberty, N. C.	----------	----------
1948	----do	Lynchburg Milling Co., Lynchburg, Va.	----------	----------
2720	----do	J. D. Manor & Co., New Market, Va.	J. P. Wyatt & Son, Raleigh, N. C.	June 30, '08
2622	----do	Mountain City Mill Co., Chattanooga, Tenn.	J. L. Smathers & Co., Murphy, N. C.	Feb. 14, '08
2740	----do	F. L. Moses & Bro., Chatham, Va.	P. H. Williamson & Co., Reidsville, N. C.	June 29, '08
2714	----do	Read Bros., Morristown, Tenn.	----------	----------
2812	----do	South River Milling Co., Salisbury, N. C.	----------	----------
1974	----do	Statesville Flour Mills Co., Statesville, N. C.	----------	----------
1952	----do	----do	----------	----------
1982	----do	----do	J. H. & W. F. Law, Greensboro, N. C.	Feb. 6, '08
2606	----do	----do	D. J. Kimball, Statesville, N. C.	Feb. 14, '08
1979	----do	Tennessee Mill Co., Estill Springs, Tenn.	R. G. Hiatt, Greensboro, N. C.	Feb. 6, '08
2620	----do	----do	J. E. Fain, Murphy, N. C.	Feb. 14, '08
2751	----do	Wachovia Mills, Winston-Salem, N. C.	Wachovia Mills, Winston, N. C.	July 1, '08
2625	Wheat Bran	J. H. Walker & Co., Reidsville, N. C.	Harris & Hubbard, Reidsville, N. C.	Feb. 26, '08

DISCUSSION OF RESULTS.

Fifty-one (51) samples of pure wheat bran and mixed brans were examined.

WHEAT MIDDLINGS AND SHORTS.

The terms "middlings" and "shorts" are frequently used interchangeably. Some of the middlings have been found to be made up of reground bran, occasionally mixed with other products. Middlings are rich in protein and low in

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2864	Shorts	Akin-Erskine Milling Co., Evansville, Ind.	H. M. Blackwelder, Concord, N. C.	July 9, '08
2728	----do	----do	W. A. Myatt, Raleigh, N. C.	June 30, '08
2632	Wheat Middlings	Andrew Bowling, Staunton, Va.	Shelton Bros., Winston, N. C.	Feb. 24, '08
2627	Middlings	----do	Harris & Hubbard, Reidsville, N. C.	Feb. 26, '08
2738	----do	----do	Hutcherson Bros., Reidsville, N. C.	June 29, '08

BRAN AND MIXED BRANS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
1995	100	14.75	4.38	6.14	------	14.75	3.61	9.80	------	Wheat product.
2760	------	------	------	------	------	14.25	4.30	7.72	------	do.
2656	100	14.50	4.00	9.50	------	14.75	4.18	9.10	------	do.
1960	------	------	------	------	------	13.62	4.26	8.45	------	do.
1948	------	------	------	------	------	17.12	4.02	10.52	------	do.
2720	100	14.75	4.20	8.53	------	15.75	4.17	7.95	------	do.
2622	100	14.50	4.00	9.50	------	16.25	4.49	7.65	------	Product.
2740	------	------	------	------	------	15.00	4.53	8.12	------	Wheat product.
2714	------	------	------	------	------	14.50	4.48	8.22	------	do.
2812	------	------	------	------	------	14.50	3.99	9.50	------	do.
1974	------	------	------	------	------	14.75	4.45	10.81	------	do.
1952	------	------	------	------	------	14.87	3.70	9.14	------	do.
1982	100	17.50	3.50	7.25	------	14.50	4.24	9.20	------	do.
2606	80	17.50	3.50	7.25	------	14.38	4.53	9.45	------	do.
1979	100	14.00	5.00	9.50	------	15.00	4.38	9.57	------	do.
2620	80	14.00	5.00	9.50	------	14.63	4.11	8.65	------	do.
2751	------	14.00	4.00	11.00	------	13.12	4.69	8.85	------	Wheat bran, small amount corn bran.
2625	100	16.87	4.48	6.82	------	14.88	5.00	8.45	------	Wheat product.

Thirteen (13) samples were below the guarantee in protein.

When wheat and corn bran are mixed the mixture must be branded mixed bran.

fiber, and for this reason are very excellent feed for hogs. The name "middlings" or "shorts" indicates that the feed is an all-wheat product, but sometimes it is mixed with other substances, and when it is mixed its feeding value, in most cases, is reduced.

NATION OF SHORTS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2864	------	16.36	4.50	3.90	------	15.75	3.58	5.67	------	Wheat product.
2728	100	16.36	4.50	3.90	------	17.12	5.21	5.83	------	do.
2632	100	15.00	4.00	6.00	------	15.38	3.85	2.32	------	do.
2627	100	15.00	4.00	6.00	------	15.63	3.69	1.95	------	do.
2738	------	15.00	4.00	6.00	------	15.00	3.46	2.37	------	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
1963	Shorts	Andrew Bowling, Staunton, Va.		
1964	Middlings	----do		
2884	Mixed Middlings	Asheville Milling Co., Asheville, N. C.	R. L. McConnaughy, Morganton, N. C.	Aug. 11, '08
2612	Middlings	----do	Forney & Co., Morganton, N. C.	Feb. 13, '08
1949	Shorts	Augusta Roller Mills, Staunton, Va.		
1966	Middlings	Carolina Roller Mills, Durham, N. C.		
2821	----do	H. C. Cole Milling Co., Chester, Ill.		
1986	Shorts	Crown Milling Co., Ashboro, N. C.	G. G. Hendricks, Ashboro, N. C.	Feb. 7, '08
1988	----do	----do	C. L. Cranford, Ashboro, N. C.	Feb. 7, '08
2726	Middlings	The Dunlop Milling Co., Clarksville, Tenn.	Crowder & Rand, Raleigh, N. C.	June 30, '08
2719	----do	----do	J. P. Wyatt & Son, Raleigh, N. C.	June 30, '08
2698	----do	----do	Leak & Marshall, Wadesboro, N. C.	April 15, '08
2691	----do	----do	The Armfield Co., Fayetteville, N. C.	April 20, '08
2668	----do	----do	Hales & Edwards, Rocky Mount, N. C.	Mar. 24, '08
2634	----do	----do	Bost & Newton, Hickory, N. C.	Feb. 12, '08
2609	----do	----do	McComb & Bros., Hickory, N. C.	Feb. 12, '08
2794	----do	----do	Elmere-Maxwell Co., Greensboro, N. C.	July 6, '08
2860	Shorts	Eagle Flouring Mill Co., Sweetwater, Tenn.	Burkmeyer Bros., Hendersonville, N. C.	July 22, '08
2859	----do	----do	S. A. Privett, Hendersonville, N. C.	July 22, '08
2732	Middlings	Eagle Roller Mills, New Ulm, Minn.	The Patterson Co., Greensboro, N. C.	June 26, '08
2689	----do	----do	Adams Grain and Provision Co., Fayetteville, N. C.	April 20, '08
1977	Red Dog Flour (Superb)	----do	The Patterson Co., Greensboro, N. C.	Feb. 6, '08
1910	Shorts	Eagle Flouring Mills, Sweetwater, Tenn.		
2672	White Middlings	C. A. Gambrill Mfg. Co., Baltimore, Md.	Wells Grocery Co., Wilson, N. C.	Mar. 24, '08
2881	Shorts	Glen Alpine Milling Co., Glen Alpine, N. C.	Green & Kincaid, Morganton, N. C.	Aug. 11, '08
2883	----do	----do	J. A. Shupsing, Morganton, N. C.	Aug. 11, '08
2876	----do	----do		
2735	Middlings	H. S. Holiday Milling Co., Cairo, Ill.	Harris & Hubbard, Reidsville, N. C.	June 29, '08
2630	----do	The Hunter Bros. Milling Co., St. Louis, Mo.	Standard Feed and Seed Co., Winston, N. C.	Feb. 24, '08
2604	Shorts	Koiner Flour Mills, Richmond, Va.	O. M. Boyd & Co., Gastonia, N. C.	Feb. 11, '08
2961	----do	Liberty Milling Co., Liberty, N. C.		
2733	Middlings (Red Dog)	The Piedmont Mills, Lynchburg, Va.	The Patterson Co., Greensboro, N. C.	June 27, '08
2761	Daisy Middlings	Pillsbury Mills, Minneapolis, Minn.	H. Schafer, Mt. Airy, N. C.	July 3, '08
2748	----do	----do		June 30, '08
2713	Shorts	Read Bros., Morristown, Tenn.		
2614	----do	----do	Asheville Grocery Co., Asheville, N. C.	Feb. 13, '08

TION OF SHORTS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
1963	------	------	------	------	------	18.00	5.42	7.94	------	Wheat product.
1964	------	------	------	------	------	16.37	4.10	3.14	------	do.
2884	80	14.00	3.00	4.00	------	13.50	3.54	3.30	------	do.
2612	80	16.00	4.44	3.43	------	15.25	4.72	6.50	------	do.
1949	------	------	------	------	------	16.75	4.61	7.86	------	do.
1966	------	------	------	------	------	16.75	3.48	3.77	------	do.
2821	------	------	------	------	------	19.25	5.48	6.00	------	do.
1986	80	17.00	4.80	4.00	------	17.12	5.02	4.85	------	do.
1988	80	17.00	4.00	4.50	------	15.50	4.52	4.65	------	do.
2726	100	16.04	4.17	4.58	------	16.12	4.88	5.00	------	do.
2719	100	16.04	4.17	4.58	------	16.13	4.60	4.85	------	do.
2698	100	15.93	4.89	------	------	15.38	4.77	5.00	------	do.
2691	80	16.04	4.17	4.52	------	16.38	5.12	4.45	------	do.
2668	100	16.04	4.17	4.58	------	16.44	5.09	5.12	------	do.
2634	100	16.04	4.17	4.58	------	15.88	4.70	5.65	------	do.
2609	100	15.93	4.89	------	------	16.75	5.37	4.57	------	do.
2794	------	16.04	4.17	4.58	------	15.63	4.99	4.82	------	do.
2860	------	16.50	5.75	5.50	------	14.38	4.26	3.87	------	do.
2859	------	16.50	5.75	5.50	------	15.00	4.57	3.92	------	do.
2732	------	16.80	3.40	3.00	------	17.87	4.53	2.05	------	do.
2689	100	13.57	5.82	------	------	18.25	4.71	2.52	------	do.
1977	100	18.57	5.62	------	------	18.25	5.04	2.72	------	do.
1910	------	------	------	------	------	15.12	3.95	4.50	------	do.
2672	80	16.85	4.40	3.00	------	16.38	4.44	4.15	------	do.
2881	------	------	------	------	------	16.75	4.62	4.30	------	do.
2883	------	------	------	------	------	16.50	4.50	4.65	------	do.
2876	------	------	------	------	------	16.25	2.78	3.75	------	do.
2735	100	13.00	2.50	1.25	------	15.25	2.76	1.22	------	do.
2630	------	16.00	4.00	------	------	13.87	4.50	4.80	------	do.
2604	80	16.56	4.99	7.53	------	16.25	4.75	6.77	------	do.
2961	------	------	------	------	------	14.37	3.95	3.92	------	do.
2733	100	15.75	4.07	1.77	------	15.25	3.42	2.85	------	do.
2761	------	16.00	4.50	4.00	------	18.00	5.29	2.22	------	do.
2748	------	16.00	4.50	4.00	------	17.12	5.73	3.02	------	do.
2713	------	------	------	------	------	17.50	6.08	5.20	------	do.
2614	80	13.50	4.50	4.50	------	15.75	5.76	5.02	------	do.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2731	Shorts	Southern Mills, Nashville, Tenn.	Hunter & Dunn, Raleigh, N. C.	June 30, '08
2683	----do	----do	J. W. Carter, Maxton, N. C.	April 16, '08
2815	---.do	South River Milling Co., Salisbury, N. C.		
2680	----do	Star Mills, Nashville, Tenn.	R. E. Lee, Laurinburg, N. C.	April 16, '08
2607	Standard Middlings	J. I. Triplett, Woodstock, Va.	D. J. Kimball, Statesville, N. C.	Feb. 12, '08
2741	Shorts	Washburn-Crosby Co., Louisville, Ky.	Frank Burton, Reidsville, N. C.	June 29, '08
2799	Standard Middlings	Washburn Mills, Minneapolis, Minn.	High Point Milling Co., High Point, N. C.	July 6, '08
2866	Shorts	Washburn-Crosby Co., Louisville, Ky.	W. B. Cooper, Wilmington, N. C.	July 24, '08
2779	Middlings	Ted B. Young, Norfolk, Va.	H. C. Privott, Edenton, N. C.	July 16, '08

DISCUSSION OF RESULTS.

Fifty (50) samples of middlings were examined and all were found to be

BRAN AND SHORTS.

When a feed is marked "Bran and Shorts" it is supposed to be made up of

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2865	Bran and Shorts	Acme Milling Co., Talbot, Tenn.	Bessemer Mercantile Co., Bessemer City, N. C.	July 14, '08
2877	----do	Glen Alpine Milling Co., Glen Alpine, N. C.		
2882	----do	----do	J. A. Shupsing, Morganton, N. C.	Aug. 11, '08
2805	----do	Grimes Milling Co., Salisbury, N. C.	H. Z. white, Salisbury, N. C.	July 8, '08
1916	----do	----do		
2886	----do	The Home Milling Co., Lenoir, N. C.	Kincaid, Lenoir, N. C.	Aug. 12, '08
2857	----do	J. Lee Koiner, Richmond, Va.	Edward Campbell, Charlotte, N. C.	July 10, '08
2849	----do	Newton Roller Mills, Newton, N. C.	Chambers & Moody, Charlotte, N. C.	July 10, '08
2850	----do	----do	W. L. C. Killiam & Son, Gastonia, N. C.	July 11, '08
2863	----do	T. J. Ransoms, Lincolnton, N. C.	Wampum Department Store, Lincolnton, N. C.	July 13, '08
2803	----do	Salisbury Milling Co., Salisbury, N. C.	H. Z. White, Salisbury, N. C.	July 8, '08
2813	----do	South River Milling Co., Salisbury, N. C.		
1953	----do	Statesville Flour Mills, Statesville, N. C.		
2887	----do	----do	W. P. McLain, Statesville, N. C.	Aug. 13, '08
2852	----do	----do	W. B. Palmer, Shelby, N. C.	July 15, '08

DISCUSSION OF RESULTS.

Fifteen (15) samples of bran and shorts were examined, and all were found to be pure wheat products.

TION OF SHORTS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2731	100	16.00	4.00	6.00	------	17.12	5.27	4.45	------	Wheat product.
2683	100	16.00	4.00	6.00	------	15.63	4.42	5.15	------	do.
2815	------	------	------	------	------	15.37	4.53	6.00	------	do.
2680	100	16.00	4.00	6.00	------	16.50	5.38	5.45	------	do.
2607	------	16.00	4.75	------	------	16.00	5.11	5.82	------	do.
2741	------	12.80	4.85	------	------	15.62	4.75	6.50	------	do.
2799	200	15.00	4.00	9.00	------	15.38	5.11	7.05	------	do.
2866	------	18.00	4.50	------	------	15.50	4.46	6.52	------	do.
2779	------	------	------	------	------	14.38	3.24	2.17	------	do.

pure wheat products. Fifteen (15) are below standard of 15 per cent protein.

pure bran and shorts run together. It cannot be marked "Bran and Shorts" if it contains anything except pure wheat products.

TION OF BRAN AND SHORTS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2865	80	16.00	5.00	7.17	------	15.25	4.27	5.95	------	Wheat product.
2877	------	------	------	------	------	15.50	4.35	6.00	------	do.
2882	------	------	------	------	------	12.63	3.57	5.90	------	do.
2805	------	15.12	4.00	7.00	------	15.63	4.57	5.20	------	do.
1916	------	------	------	------	------	15.12	4.00	7.00	------	do.
2886	80	15.12	5.69	6.59	------	15.38	4.53	5.72	------	do.
2857	------	16.50	4.00	7.53	------	14.75	4.33	6.65	------	do.
2849	------	15.60	4.01	5.96	------	13.50	3.14	6.55	------	Wheat bran and corn bran.
2850	100	15.60	4.01	5.96	------	14.50	3.76	4.92	------	Wheat product.
2863	------	14.50	4.00	8.00	------	14.75	5.45	6.35	------	do.
2803	80	16.00	6.00	10.00	------	14.13	4.88	5.85	------	Wheat product and corn bran.
2813	------	------	------	------	------	14.57	4.42	8.00	------	Wheat product.
1953	------	------	------	------	------	15.87	4.15	7.32	------	do.
2887	80	16.50	3.80	5.99	------	15.50	4.31	6.67	------	do.
2852	------	15.50	3.80	5.99	------	15.00	4.10	6.07	------	do.

Six (6) samples were below their guarantee.

Three (3) samples were below the standard of 14.50 per cent protein.

SHIPSTUFF.

This is a name that applies to a mixture of no definite composition. It generally indicates a finely ground product, which may be an all-wheat product

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2829	Shipstuff	Atlanta Milling Co., Atlanta, Ga.	J. H. Dellinger, Shelby, N. C.	July 15, '08
2000	----do	----do	Adams Grain and Provision Co., Charlotte, N. C.	Feb. 11, '08
2603	----do	----do	J. Flem Johnson, Charlotte, N. C.	Feb. 11, '08
2682	----do	----do	W. J. Pace, Maxton, N. C.	April 16, '08
2695	----do	----do	F. M. Hightower, Wadesboro, N. C.	April 15, '08
2755	----do	Ballard & Ballard, Louisville, Ky.	Farmers Stock Co., Winston, N. C.	July 1, '08
2676	----do	Bridgewater Milling Co., Bridgewater, N. C.	----------	----------
1968	----do	Carrolina Roller Mills, Durham, N. C.	----------	----------
1954	----do	Concord Milling Co., Concord, N. C.	----------	----------
2647	----do	----do	----------	----------
1996	----do	----do	Cannon & Fetzer Co., Concord, N. C.	Feb. 10, '08
1981	----do	Dan Valley Mills, Danville, Va.	Tucker & Irwin, Greensboro, N. C.	Feb. 6, '08
1983	----do	----do	J. H. & W. F. Law, Greensboro, N. C.	Feb. 6, '08
1994	----do	Douthat-Riddle Co., Danville, Va.	I. Littmann, Salisbury, N. C.	Feb. 8, '08
2605	----do	Dunlop Mills, Richmond, Va.	Morrison Produce and Provision Co., Statesville, N. C.	Feb. 6, '08
2633	----do	----do	Seltzer & Co., Hickory, N. C.	Feb. 18, '08
2673	----do	----do	Tomlinson & Co., Wilson, N. C.	Mar. 24, '08
2681	----do	----do	R. E. Lee, Laurinburg, N. C.	April 16, '08
2685	----do	----do	L. H. Caldwell, Lumberton, N. C.	April 18, '08
2753	----do	Forsyth Roller Mills, Winston-Salem, N. C.	Forsyth Mills, Winston, N. C.	July 1, '08
2702	----do	Harrisonburg Milling Co., Harrisonburg, Va.	E. N. Covington & Co., Rockingham, N. C.	April 14, '08
2800	Shipstuff and Bran	High Point Milling Co., High Point, N. C.	High Point Milling Co., High Point, N. C.	July 6, '08
2797	Shipstuff	----do	V. W. Idol & Co., High Point, N. C.	July 6, '08
1947	----do	Lynchburg Milling Co., Lynchburg, Va.	----------	----------
2651	----do	Mayo Milling Co., Richmond, Va.	Southerland Co., Goldsboro, N. C.	Mar. 16, '08
2847	----do	Mountain City Mill Co., Chattanooga, Tenn.	Lippard & Barrier, Concord, N. C.	July 9, '08
2848	----do	----do	W. F. Morrison, Concord, N. C.	July 9, '08
2608	----do	----do	Bost & Newton, Hickory, N. C.	Feb. 18, '08
2618	----do	----do	John H. Jenkins, Asheville, N. C.	Feb. 13, '08
2868	----do	----do	Feed and Lumber Co., Waynesville, N. C.	July 24, '08
1978	----do	Piedmont Mills, Lynchburg, Va.	The Patterson Co., Greensboro, N. C.	Feb. 6, '08
2684	----do	----do	J. T. McNeill, Red Springs, N. C.	April 17, '08
2729	----do	Riverside Milling and Power Co., Cartersville, Ga.	C. A. Norris Co., Raleigh, N. C.	June 30, '08

or a mixture with wheat product as the basis and such other substances as finely ground corn bran, rice chaff, corn cobs, and oat hulls.

Shipstuff is so fine that the adulterants cannot be seen with the naked eye, and this fact is taken advantage of by unscrupulous manufacturers.

NATION OF SHIPSTUFF.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2839	80	13.00	4.00	9.50	------	13.38	3.67	4.92	------	
2000	80	13.00	4.00	9.50	------	13.50	5.69	5.77	------	Wheat product and corn bran.
2603	80	13.00	4.00	9.50	------	13.38	4.81	5.97	------	do.
2682	80	13.00	4.00	9.50	------	13.75	5.08	6.45	------	Finely ground wheat bran and corn bran.
2695	100	13.00	4.00	9.50	------	12.13	4.48	5.15	------	Wheat and corn product.
2755	------	16.50	4.80	6.87	------	15.75	4.26	4.70	------	Wheat product.
2676	------	------	------	------	------	12.25	3.64	7.90	------	Wheat bran and corn bran.
1968	------	------	------	------	------	15.75	4.01	8.80	------	Wheat product.
1954	------	------	------	------	------	15.63	4.51	6.88	------	do.
2647	------	------	------	------	------	12.63	5.20	7.95	------	Wheat bran and corn product.
1996	100	15.62	3.45	3.74	------	14.50	3.95	5.57	------	Mostly wheat product.
1981	100	15.00	4.00	6.00	------	16.00	4.34	6.45	------	Wheat product.
1983	100	15.00	4.00	6.00	------	14.38	4.28	6.45	------	do.
1994	80	10.00	3.75	12.00	------	8.75	3.18	11.45	------	Wheat product and corn cob finely ground.
2605	80	14.50	4.00	8.00	------	15.50	4.92	8.00	------	Wheat product containing small amount of corn product.
2633	100	14.50	4.00	8.00	------	16.75	4.02	6.90	------	Wheat product.
2673	100	14.50	4.00	8.00	------	16.13	------	5.45	------	Wheat product containing some corn.
2681	100	14.50	4.00	8.00	------	15.63	4.31	5.35	------	Wheat and corn product.
2685	100	14.50	4.00	8.00	------	16.13	4.99	5.97	------	Wheat product containing some corn product.
2753	------	15.00	4.00	6.00	------	14.62	4.27	5.17	------	Wheat and corn product.
2702	100	15.50	4.26	5.94	------	15.50	5.61	4.95	------	Wheat product.
2800	80	15.87	4.65	6.29	------	15.13	5.28	7.25	------	do.
2797	80	15.12	4.45	4.25	------	17.50	4.88	5.20	------	do.
1947	------	------	------	------	------	15.00	4.45	8.55	------	do.
2651	100	15.62	3.95	6.00	------	16.00	4.83	6.32	------	Wheat and corn product.
2847	100	13.00	5.50	7.00	------	13.86	6.29	5.80	------	do.
2848	------	13.00	5.50	7.00	------	12.63	5.63	4.60	------	do.
2608	100	13.00	5.50	7.00	------	13.75	5.95	6.57	------	Wheat bran and corn bran.
2618	100	13.00	5.50	7.00	------	14.50	5.77	5.52	------	do.
2868	100	13.00	5.50	7.00	------	14.25	5.71	5.82	------	do.
1978	100	15.00	4.00	6.00	------	13.62	4.14	6.75	------	Wheat product.
2684	100	15.00	4.00	6.00	------	15.63	4.48	5.77	------	do.
2729	------	------	------	------	------	9.45	4.27	7.82	------	Wheat bran and corn bran.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2687	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.	A. E. Rankin & Co., Fayetteville, N. C.	April 20, '08
1970	----do	Southside Mills, Winston-Salem, N. C.		
1973	----do	Statesville Flour Mills, Statesville, N. C.		
1975	Mixed Shipstuff	----do		
2854	Shipstuff	----do	W. J. Glass, Concord, N. C.	July 9, '08
2853	----do	----do	W. B. Palmer, Shelby, N. C.	July 15, '08
2888	----do	----do	J. L. Cowan, Statesville, N. C.	July 14, '08
2872	----do	E. F. Spears & Sons, Paris, Ky.	J. L. Smathers & Co., Murphy, N. C.	July 25, '08
2870	----do	----do	R. H. Hyatt & Co., Murphy, N. C.	July 25, '08
2621	----do	Tennessee Mill Co., Estill Springs, Tenn.	J. E. Fain, Murphy, N. C.	Feb. 14, '08
2750	----do	Wachovia Mills, Winston-Salem, N. C.	Wachovia Mills, Winston, N. C.	July 1, '08
2742	----do	J. H. Walker & Co., Reidsville, N. C.	Frank Burton, Reidsville, N. C.	June 29, '08
2709	----do	A. B. Williams, North Wilkesboro, N. C.		
2835	----do	Wilson Grocery Co., Wilson, N. C.	Wilson Grocery Co., Wilson, N. C.	July 22, '08

DISCUSSION OF RESULTS.

Forty-seven (47) samples of shipstuff were examined. Twenty-one (21) were pure wheat products and twenty-six (26) were mixtures of wheat and other products.

OAT FEEDS AND CORN AND OAT FEEDS.

In the manufacture of oat products for human food the kernel of the oat is separated from the hull. Oat hulls are in themselves low in food value, being very much like straw in this regard. Their value may be materially greater if broken kernels or small oats are ground in with them. Manufacturers of oat products are putting ground oat hulls on the market in many forms, such

RESULTS OF THE EXAMINATION OF

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2662	Boss Chop Feed	The Great Western Cereal Co., Chicago, Ill.	M. G. Brown & Co., Edenton, N. C.	Mar. 20, '08
2660	----do	----do	Burrus & Gray Co., New Bern, N. C.	Mar. 18, '08
2791	----do	----do	M. P. Gallop Co., Elizabeth City, N. C.	July 17, '08
2790	----do	----do	T. P. Nash, Elizabeth City, N. C.	July 16, '08
2780	----do	----do	H. C. Privott, Edenton, N. C.	July 7, '08
2699	Protena Horse Feed	Purina Mills, St. Louis, Mo.	M. L. Millikin, Hamlet, N. C.	Apr. 14, '08
2768	Victor Feed	The Quaker Oats Co., Chicago, Ill.	Burrus & Gray, New Bern, N. C.	July 11, '08

TION OF SHIPSTUFF—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2687	100	15.00	5.00	7.00	------	14.50	4.19	4.75	------	Wheat and corn feed.
1970	------	------	------	------	------	15.43	4.68	5.77	------	Wheat product.
1973	------	------	------	------	------	18.00	5.67	5.96	------	do.
1975	------	------	------	------	------	14.81	5.56	5.70	------	Wheat and corn product.
2854	------	16.00	4.00	6.75	------	16.25	3.81	5.25	------	Wheat product.
2853	80	16.00	4.00	6.75	------	15.13	2.96	5.62	------	
2888	100	16.00	4.00	6.75	------	15.00	4.31	6.37	------	Wheat product.
2872	------	------	------	------	------	13.13	4.42	6.60	------	Wheat and corn product.
2870	------	------	------	------	------	14.25	4.74	6.90	------	Mostly wheat product.
2621	80	16.00	4.00	5.00	------	17.00	6.41	5.50	------	Wheat product.
2750	------	14.00	4.00	4.00	------	14.75	4.77	4.50	------	do.
2742	------	16.75	4.50	4.71	------	14.75	3.94	2.62	------	do.
2709	------	------	------	------	------	16.75	5.19	5.62	------	do.
2835	100	10.00	4.00	3.00	------	8.38	3.41	5.05	------	Corn product, some oats and wheat.

Close inspection of the above table will reveal the merits of the different shipstuffs.

Fourteen (14) samples were below their guarantee in protein.

as Oat Feed, Oat Chops, Corn and Oat Feed, Purina Feed, Boss Corn and Oat Feed, Vim Oat Feed, Victor Corn and Oat Feed, Model Corn and Oat Feed, Quaker Dairy Feed, and others. The bulk of all these materials is ground oat hulls, with admixture of ground corn and oat kernels. The feeding value of them is variable and they should never be bought except on a guaranteed composition, and then it should be remembered that the oat hulls are not as digestible as the kernel of oats or other grains.

OAT FEEDS AND CORN AND OAT FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2662	100	8.00	3.50	11.00	------	8.38	4.21	7.97	------	Corn, oats and oat hulls.
2660	100	8.00	3.50	11.00	------	7.88	3.87	10.05	------	do.
2791	100	8.00	3.50	11.00	------	8.25	4.23	8.50	------	do.
2790	100	8.00	3.50	11.00	------	7.75	4.48	8.70	------	do.
2780	100	8.00	3.00	------	------	8.38	3.64	8.25	------	do.
2699	100	13.50	4.50	9.00	------	13.25	3.67	7.60	------	Cracked corn, oats, alfalfa and barley.
2768	------	7.50	3.00	------	------	7.13	3.65	9.92	------	Some cracked corn, oats and oat hulls.

RESULTS OF THE EXAMINATION OF OAT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2688	Victor Feed	The Quaker Oats Co., Chicago, Ill.	Adams Grain and Provision Co., Fayetteville, N. C.	April 20, '08
2781	----do	----do	M. G. Brown & Co., Edenton, N. C.	July 11, '08
1959	Purina Feed	Ralston Purina Co., St. Louis, Mo.		
1958	Protena Feed	----do		
1955	Protena Dairy Feed	----do		

DISCUSSION OF RESULTS.

Twelve (12) samples of corn and oat feeds were examined. Eight of these feeds contain less than 10 per cent protein, and are therefore low grade.

RICE FEEDS.

In preparing rice for human consumption the mills first remove the two outer layers and then polish the grain before it is ready for the market. Rice bran, rice polish and rice meal, which are known as rice feeds, are the by-products from the manufacture of rice for human consumption. Rice bran is the thin skin which lies next to the rice grain; rice polish is the by-product from polishing the rice grain after the bran has been removed; rice meal is a

RESULTS OF THE EXAMI

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2674	Extra Rice Meal	Carolina Rice Mills, Goldsboro, N. C.	Tomlinson & Co., Wilson, N. C.	Mar. 24, '08
2652	Rice Meal	----do	Southerland Co., Goldsboro, N. C.	Mar. 16, '08
2649	----do	----do	Best & Thompson, Goldsboro, N. C.	Mar. 16, '08
2811	----do	----do	Baker, Bizzell & Edgerton, Goldsboro, N. C.	July 9, '08
2808	Extra Rice Meal	----do	Best & Thompson, Goldsboro, N. C.	July 9, '08
1950	Carolina Rice Meal	West Point Mill Co., Charleston, S. C.		

DISCUSSION

Seven (7) samples of rice feed were examined. These feeds vary very much

FEEDS AND CORN AND OAT FEEDS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2688	100	7.50	3.00	12.00	------	8.50	3.70	11.27	------	Some cracked corn, oats and oat hulls.
2781	------	7.50	3.00	------	------	6.13	3.28	9.82	------	do.
1959	------	------	------	------	------	13.67	4.36	13.27	------	Wheat, cracked corn, alfalfa and barley.
1958	------	------	------	------	------	12.75	9.15	11.41	------	Cracked corn, alfalfa and barley.
1955	------	------	------	------	------	16.38	4.67	22.97	------	Mostly alfalfa and corn product.

The true character of these feeds is shown by the results in the table above.

This class of feeds bears a guaranteed analysis, which should guide the consumer in purchasing.

mixture of rice bran and rice polish. Pure rice bran is seldom found in this State, as in the majority of cases it is mixed with rice hulls or chaff, and its feeding value is accordingly reduced. The polish is free from hulls and other substances and is about as good feed as corn meal, and can be fed profitably when purchased at the same price.

Rice feeds have a high fat content, and for this reason their keeping quality is rather poor.

NATION OF RICE FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2674	100	12.37	13.44	7.66	------	10.13	4.90	8.77	------	Rice product.
2652	100	11.62	12.72	9.11	------	9.38	7.24	15.15	------	Rice meal, contains rice hulls—too large quantity.
2649	100	12.37	13.44	7.66	------	11.50	5.84	7.12	------	Rice product.
2811	100	12.00	9.00	8.00	------	10.88	9.09	11.72	------	do.
2808	100	12.25	13.25	7.78	------	12.25	10.55	8.30	------	do.
1950	------	------	------	------	------	11.12	10.75	9.59	------	do.

OF RESULTS.

in composition, and should be purchased according to the analysis they bear.

MOLASSES (SUGAR) FEEDS.

Some of these feeds are mixtures of molasses and feeds rich in protein, and should be productive of good results, provided the mechanical condition is satisfactory and the price is not excessive.

Molasses is a carbohydrate and can be fed in small quantities to cattle satis-

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2858	Sucrene Horse, Mule and Ox Feed.	American Milling Co., Philadelphia, Pa.	----------	July 10, '08
2718	----do ----------	American Milling Co., Chicago, Ill.	J. P. Wyatt & Son, Raleigh, N. C.	June 30, '08
2717	Sucrene Dairy Feed -----	----do ----------	----do ----------	June 30, '08
2697	----do ----------	----do ----------	H. W. Little & Co., Wadesboro, N. C.	Apr. 14, '08
2696	----do ----------	----do ----------	Van Sikes, Monroe, N. C. ---	Apr. 16, '08
2663	----do ----------	----do ----------	H. C. Privott, Edenton, N. C.	Mar. 20, '08
2810	----do ----------	----do ----------	Best & Thompson, Goldsboro, N. C.	July 9, '08
2763	----do ----------	----do ----------	W. B. Smoot, Mount Airy, N. C.	July 3, '08
2809	Sucrene Horse, Mule and Ox Feed.	----do ----------	Best & Thompson, Goldsboro, N. C.	July 9, '08
2670	Mueller's Molasses Grains.	E. P. Mueller, Norfolk, Va.--	Wiggins Grocery Co., Wilson, N. C.	Mar. 24, '08
1998	----do ----------	----do ----------	Adams Grain and Provision Co., Charlotte, N. C.	Feb. 11, '08
2788	----do ----------	----do ----------	City Hay and Grain Co., Elizabeth City, N. C.	July 17, '08
2664	----do ----------	---- do ----------	H. C. Privott, Edenton, N. C.	Mar. 20, '08

DISCUSSION OF RESULTS.

Thirteen (13) samples of Molasses or Sugar Feeds were examined. The Sucrene Feeds are up to their guarantees and of good quality.

DRIED BEET PULP.

This is by-product from the manufacture of beet sugar from the sugar beet.

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2739	Dried Beet Pulp----------	Michigan Sugar Co., Bay City, Mich.	Hutcherson Bros., Reidsville, N. C.	June 29, '08
2873	Beet Pulp ----------	----------	Carolina Feed Store, Raleigh, N. C.	----------

DISCUSSION

Two (2) samples of best beet pulp were examined. The above

factorily, but when mixed with rich protein substances can be used in large quantities with good results.

Molasses is being used by some manufacturers to cover up adulterants in their products.

OF MOLASSES OR SUGAR FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2858	------	10.00	3.00	13.50	------	12.00	5.22	8.40	------	
2718	100	10.00	3.00	13.50	------	11.38	4.63	7.92	------	Cracked corn, oats, distillery product, molasses and weed seed.
2717	100	16.50	3.50	12.00	------	17.75	6.71	10.55	------	do.
2697	100	16.50	3.50	12.00	------	17.63	7.39	13.70	------	Weed seeds, whole oats, molasses, barley, corn product and cotton-seed meal.
2696	100	16.50	3.50	------	------	17.13	6.74	13.15	------	do.
2663	------	------	------	------	------	18.88	5.82	11.72	------	Large quantity of weed seed, whole oats, molasses, barley, some cotton-seed meal and corn product.
2810	100	16.50	3.50	12.00	------	17.50	6.16	11.60	------	Weed seed, whole oats, molasses, barley, corn product and cotton-seed meal.
2763	------	16.50	3.50	12.00	------	17.25	5.35	10.80	------	do.
2809	100	10.00	3.00	13.50	------	12.75	3.72	11.15	------	Cracked corn, oats, distillery product, molasses and weed seed.
2670	100	19.81	2.73	------	------	13.88	4.03	9.67	------	Probably small amount cotton-seed meal, mostly hulls, barley hulls and clippings and molasses.
1998	------	------	------	------	------	10.00	2.24	20.05	------	do.
2788	100	22.54	------	------	------	6.00	6.25	9.42	------	do.
2664	100	19.81	2.73	------	------	8.75	2.39	9.95	------	do.

The samples of Mueller's Molasses Grain were all below their guarantee, and are of very inferior quality, composed largely of oat hulls, barley hulls or clippings and screenings.

It is composed in part of the cell walls of the beet root, and for this reason contains considerable crude fiber.

TION OF DRIED BEET PULP.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2739	------	10.00	.80	------	------	9.25	1.47	16.85	------	Beet pulp.
2873	------	------	------	------	------	8.88	1.15	17.22	------	do.

OF RESULTS.

analyses will reveal the nutritive value of this product.

CHOPS, HOMINY MEALS AND FEEDS.

The hard part of the corn kernel, known as hominy or hominy grits, is used

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2789	Hominy Feed	Aydlett Bros. Co., Elizabeth City, N. C.	Adylett Bros. Co., Elizabeth City, N. C.	July 17, '08
2650	Corn Chops	Boney & Harper, Wilmington, N. C.	J. W. Isler & Co., Goldsboro, N. C.	Mar. 16, '08
2827	----do	----do	Wells Grocery Co., Wilson, N. C.	July 22, '08
1911	----do	A. O. Bray, Elkin, N. C.	----do	
2893	Ajax Chops	Chilhowie Milling Co., Chilhowie, Va.	----do	
2894	Chops	----do	----do	
2646	Corn Chops	Concord Milling Co., Concord, N. C.	----do	
2624	----do	Forsyth Roller Mills, Winston-Salem, N. C.	P. R. Lamb & Co., Winston, N. C.	Feb. 24, '08
2754	----do	----do	Forsyth Roller Mills, Winston, N. C.	July 1, '08
2762	Chops	Granite City Mills, Mt. Airy, N. C.	W. B. Smoot, Mt. Airy, N. C.	July 3, '08
2724	Hominy Feed, "Scioto"	The Portsmouth Cereal Co., Portsmouth, Ohio.	Len H. Adams, Raleigh, N. C.	June 30, '08
1984	Chop Feed	W. A. Watson, Greensboro, N. C.	J. H. & W. F. Law, Greensboro, N. C.	Feb. 6, '08
2749	Corn Chops	Wachovia Mills, Winston-Salem, N. C.	Wachovia Mills, Winston-Salem, N. C.	June 30, '08
2623	----do	----do	Shelton Bros., Winston, N. C.	Feb. 24, '08

DISCUSSION OF RESULTS.

Fourteen (14) samples of chops, hominy meals and feeds were examined. The name "Chops" generally applies to a feed composed entirely of corn prod-

COTTON-SEED FEEDS.

If cotton-seed meal contains less than 38.6 per cent protein it is below the standard required by the law on this subject and has had hulls or some other adulterant ground with it. Hulls are found with meal rather extensively and the mixture is no longer sold as genuine cotton-seed meal, but as cotton-seed

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2665	Creamo Brand Feed Meal	Tennessee Fiber Co., Memphis, Tenn.	Pamlico Grocery Co., Washington, N. C.	Mar. 21, '08
2666	----do	----do	E. K. Willis, Washington, N. C.	Mar. 21, '08
2615	----do	----do	Asheville Grocery Co., Asheville, N. C.	Feb. 13, '08

DISCUSSION OF RESULTS.

Three (3) samples of cotton-seed feeds were examined. All of these samples

for human food. The residue, or soft part of the kernel, sometimes called white meal, is sold as a cattle feed, and consists of the hull, germ and more or less of the protein and starch. It has a feeding value similar to dry corn meal.

OF HOMINY FEED, CHOPS AND MEALS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2789	100	10.00	4.00	4.00	------	9.00	4.05	1.82	------	Cracked corn.
2650	100	10.00	7.25	7.50	------	8.75	6.31	10.17	------	Corn product.
2827	100	10.00	7.25	7.50	------	8.88	6.70	9.10	------	do.
1911	------	------	------	------	------	8.00	4.06	2.02	------	do.
2893	------	------	------	------	------	14.50	4.16	4.50	------	do.
2894	------	------	------	------	------	14.50	4.51	4.40	------	do.
2646	------	------	------	------	------	8.50	4.47	2.50	------	do.
2624	100	9.87	3.91	1.97	------	8.88	4.26	1.75	------	do.
2754	------	9.87	3.91	1.97	------	8.25	4.00	1.60	------	do.
2762	------	9.50	4.00	4.00	------	9.50	3.82	6.45	------	do.
2724	100	10.00	6.00	------	------	9.15	2.88	5.25	------	do.
1984	100	13.86	3.95	4.63	------	14.62	3.70	6.05	------	do.
2749	------	9.00	4.00	1.00	------	8.25	4.25	1.02	------	do.
2623	100	9.00	4.00	1.00	------	9.38	3.98	2.65	------	do.

ucts, but this is not strictly adhered to, as some chops are mixed with other substances. Samples 2893 and 2894 are called chops, but are wheat products. The per cent of protein guaranteed in these products is too high, as very few of the samples come up to the guarantee.

meal feed for cattle, etc. These feeds are valuable in proportion to the amount of meal in the mixture, which is measured by the protein in the analysis.

Cotton-seed feeds must have a guaranteed analysis consisting of the per cents of protein, fat and crude fiber on every bag or tag attached thereto, and not the per cent of nitrogen or ammonia.

TION OF COTTON-SEED FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2665	100	22.00	5.00	28.00	------	------	4.95	22.65	------	Cotton-seed meal, containing finely ground cotton-seed hulls.
2666	100	22.00	5.00	28.00	------	18.87	3.76	22.35	------	do.
2615	------	22.00	5.00	28.00	------	21.75	4.65	20.05	------	do.

are below their guarantees in fat, and two samples are below their guarantees in protein.

SPECIAL

Under this head are grouped those feeds which are

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2671	Thoroughbred Feed	Lexington Roller Mills, Lexington, Ky.	Wilson Grocery Co., Wilson, N. C.	Mar. 24, '08
2667	----do	----do	E. K. Willis, Washington, N. C.	Mar. 21, '08
2700	----do	----do	J. H. Tice, Wadesboro, N. C.	Apr. 15, '08
2770	----do	----do	Edwards & Pegram, Kinston, N. C.	July 10, '08
2654	Corno Horse and Mule Feed.	The Corno Mills, East St. Louis, Ill.	Stone & Co., Wilmington, N. C.	Mar. 17, '08
2834	----do	----do	Wilson Grocery Co., Wilson, N. C.	July 21, '08
2825	----do	----do	W. B. Cooper, Wilmington, N. C.	July 24, '08
2796	----do	----do	The Patterson Co., Greensboro, N. C.	July 6, '08
2746	----do	----do	Standard Seed Feed Co., Winston, N. C.	June 30, '08
2786	Mixed Corn and Oat Feed.	W. S. White & Co., Elizabeth City, N. C.	W. S. White & Co., Elizabeth City, N. C.	July 18, '08
1940	Hollybrook Scratching Food.	T. W. Wood & Sons, Richmond, Va.		
1939	Hollybrook Chick Food	----do		
1938	Hollybrook Forcing Food.	----do		
1937	Hollybrook Pigeon Mixture.	----do		
1936	Hollybrook Developing Food.	----do		
1935	Wood's Poultry Grain Food.	----do		
1934	Wood's Practical Ration	----do		
2722	Wyatt's Special Cow Feed.	J. P. Wyatt & Sons, Raleigh, N. C.	J. P. Wyatt & Sons, Raleigh, N. C.	June 20, '08

DISCUSSION

Eighteen (18) samples of special named feeds were

MISCELLANEOUS FEEDS.

Under this head are grouped mill feeds, mixed feeds, mill sweepings, screen-

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2703	Mill Feed	Aberdeen Power and Milling Co., Aberdeen, N. C.	E. J. Hale & Son, Rockingham, N. C.	Apr. 10, '08
2619	Acme Feed	Acme Milling Co., Talbot, Tenn.	John H. Jenkins, Asheville, N. C.	Feb. 13, '08
2837	----do	----do	J. L. Allen, Rutherfordton, N. C.	July 16, '08
2838	----do	----do	William Edward McCall, Marion, N. C.	Feb. 17, '08
2626	Mixed Feed	Adams Grain and Provision Co., Richmond, Va.	J. H. Burton, Reidsville, N. C.	Feb. 28, '08

MIXED FEEDS.

sold under trade-mark, proprietary or special names.

OF SPECIAL MIXED FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2671	100	16.41	3.62	7.53	------	15.63	5.07	3.63	------	Wheat and corn feed.
2667	100	13.40	3.62	7.58	------	15.13	3.98	6.15	------	do.
2700	100	15.05	3.34	6.56	------	14.13	2.77	5.50	------	do.
2770	100	15.05	3.34	6.56	------	14.50	5.07	6.57	------	do.
2654	100	10.00	3.50	12.00	------	9.88	4.10	10.40	------	Cracked corn, oats, alfalfa.
2834	------	10.00	3.50	12.00	------	8.75	3.81	13.10	------	do.
2825	100	10.00	3.50	12.00	------	9.63	3.68	11.07	------	do.
2796	------	13.00	3.50	12.00	------	9.12	3.39	11.85	------	do.
2746	100	14.00	3.50	12.00	------	10.50	4.22	11.70	------	do.
2786	100	11.44	4.92	8.82	------	8.50	3.92	3.02	------	Cracked corn and whole oats.
1940	------	------	------	------	------	10.87	3.48	2.92	------	Cracked corn, wheat, ground beans, rye, weed seed, sunflower seed, barley.
1939	------	------	------	------	------	11.50	3.90	3.02	------	
1938	------	------	------	------	------	10.62	3.41	2.88	------	
1937	------	------	------	------	------	12.87	3.44	3.90	------	Beans, wheat, rye, corn, weed seed and sunflower seed.
1936	------	------	------	------	------	11.87	3.41	3.45	------	Cracked corn, wheat, rye, beans, weed seed and sunflower seed.
1935	------	------	------	------	------	12.37	3.21	4.25	------	Wheat grain, cracked corn, cracked beans, peas, weed seed and rye.
1934	------	------	------	------	------	14.75	4.48	5.66	------	Wheat product, corn product, cracked beans and weed seed.
2722	100	21.00	3.50	14.00	------	32.65	4.85	7.75	------	Wheat product, cotton-seed meal, linseed meal and corn meal.

OF RESULTS.

examined. Most of these feeds are of good quality.

ings, feed meals, etc. An idea of the quality of these feeds is given in the table below.

OF MISCELLANEOUS FEEDS.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2703	100	9.00	4.50	10.00	------	7.75	2.56	8.20	------	Mostly corn bran.
2619	------	16.00	5.00	7.17	------	14.00	6.08	6.75	------	Wheat bran and corn bran.
2837	------	16.00	5.00	7.17	------	12.75	5.50	6.50	------	Wheat and corn product.
2838	80	16.00	5.00	7.17	------	15.12	4.35	6.60	------	do.
2626	------	------	------	------	------	13.50	3.35	3.40	------	do.

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
1990	Mill Feed	Ashboro Roller Mills, Ashboro, N. C.		Feb. 7, '08
2844	Feed	Asheville Milling Co., Asheville, N. C.	Gaston & Troutman, Marion, N. C.	July 17, '08
2843	----do	----do	Reid & Beim, Rutherfordton, N. C.	July 16, '08
1992	Mill Feed	Archdale Roller Mills, Archdale, N. C.	J. S. Kinley, High Point, N. C.	Feb. 7, '08
2840	Dairy and Stock Feed	Atlanta Milling Co., Atlanta, Ga.	The G. C. Brinkman Co., Charlotte, N. C.	July 10, '08
2747	Union Grains	The J. W. Biles Co., Cincinnati, Ohio.	Standard Feed and Seed Co., Winston, N. C.	June 30, '08
2710	Mixed Middling Feed	Capital Grain and Mill Co., Nashville, Tenn.		
2711	----do	----do		
2725	Mixed Bran Feed	----do	Len H. Adams, Raleigh, N. C.	June 30, '08
2716	Mixed Middling Feed	----do	In Car A. C. L., No. 30255, Aulander, N. C.	June 25, '08
2629	Mixed Bran Feed	----do	Standard Feed and Seed Co., Winston, N. C.	Feb. 24, '08
2785	----do	----do	W. S. White & Co., Elizabeth City, N. C.	July 17, '08
2778	----do	----do	H. C. Privott, Edenton, N. C.	July 16, '08
2708	Mixed Middling Feed	----do		
2707	----do	----do		
2706	----do	----do		
2701	Mill Feed	Carrolina Roller Mills, Durham, N. C.	Sanford Supply Co., Sanford, N. C.	Apr. 13, '08
2677	----do	----do	W. L. London & Son, Pittsboro, N. C.	Apr. 13, '08
1965	----do	----do		
1945	Feed	----do		
1946	----do	----do		
2784	Mixed Feed	City Hay and Grain Co., Elizabeth City, N. C.	City Hay and Grain Co., Elizabeth City, N. C.	July 17, '08
2782	Corn and Cob Meal	----do	----do	July 17, '08
2679	Mill Feed	Crown Milling Co., Ashboro, N. C.	Keith & Co., Aberdeen, N. C.	Apr. 13, '08
1987	----do	----do	C. L. Cranford, Ashboro, N. C.	Feb. 7, '08
1985	----do	----do	G. G. Hendricks & Co., Ashboro, N. C.	Feb. 7, '08
1991	----do	Dixie Milling Co., High Point, N. C.	J. S. Kinley, High Point, N. C.	Feb. 7, '08
2798	----do	----do	Hedrick & Co., High Point, N. C.	July 6, '08
2862	Mixed Feed	Douthat-Riddle Co., Danville, Va.	C. D. Shelton, Charlotte, N. C.	July 10, '08
2734	Mill Feed	----do	Elmere-Maxwell Co., Greensboro, N. C.	June 27, '08
2692	Feed	----do	The Armfield Co , Fayetteville, N. C.	Apr. 20, '08
2795	Mill Feed	----do	Elmere-Maxwell Co., Greensboro, N. C.	July 2, '08
2792	Feed	----do	E. R. Messick, Winston, N. C.	July 4, '08
2743	----do	----do	----do	June 30, '08
2823	Mixed Feed	----do		
2631	Cotton-seed Feed	Elba Mfg. Co., Charlotte, N. C.	Standard Feed and Seed Co., Winston, N. C.	Feb. 24, '08

OF MISCELLANEOUS FEEDS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
1990	77	15.00	4.00	8.00	------	14.88	3.67	7.30	------	Wheat and corn product.
2844	80	13.00	3.00	9.50	------	12.38	4.45	7.45	------	do.
2843	80	13.00	3.00	9.50	------	13.25	4.15	5.95	------	Wheat and corn bran.
1992	80	12.25	1.50	2.45	------	16.75	3.40	3.97	------	Wheat bran and corn product.
2840	80	21.00	4.00	9.50	------	22.19	5.19	6.17	------	
2747	------	24.00	7.00	7.00	------	23.37	7.77	9.52	------	Distillery grain, malt sprouts, a corn and wheat product, some linseed meal, some cotton-seed meal.
2710	------	------	------	------	------	------	1.76	12.95	------	Wheat feed, adulterated with ground corn cobs.
2711	------	------	------	------	------	6.75	0.92	17.25	------	do.
2725	100	13.42	3.80	11.24	------	9.75	2.39	5.65	------	Wheat bran, corn bran and corn cobs.
2716	100	14.26	3.70	10.90	------	------	------	------	------	Wheat feed, adulterated with ground corn cobs.
2629	100	13.42	3.80	11.24	------	10.75	2.96	11.20	------	Wheat product, adulterated with ground corn cobs.
2785	100	13.42	3.80	11.24	------	8.38	2.58	18.22	------	Wheat bran, containing ground corn cobs.
2778	100	13.42	3.80	11.24	------	9.38	2.71	16.05	------	Ground wheat bran, corn, corn bran and ground corn cobs.
2708	------	------	------	------	------	7.37	2.59	14.65	------	Wheat feed, adulterated with ground corn cobs.
2707	------	------	------	------	------	9.73	3.48	10.17	------	do.
2706	------	------	------	------	------	8.31	3.31	16.32	------	do.
2701	100	14.00	4.00	5.00	------	13.25	3.64	6.20	------	Wheat product and corn bran.
2677	100	13.75	3.95	5.88	------	14.25	3.35	4.70	------	Wheat and corn product.
1965	------	------	------	------	------	13.75	4.64	7.62	------	do.
1945	------	------	------	------	------	16.37	4.17	8.18	------	do.
1946	------	------	------	------	------	14.87	4.05	7.40	------	do.
2784	------	10.00	4.00	5.00	------	8.75	3.73	2.67	------	Corn and oat feed.
2782	------	8.00	3.00	6.00	------	7.13	4.51	5.07	------	Ground ear corn.
2679	80	12.00	4.00	14.00	------	12.00	4.38	5.25	------	Wheat bran and corn bran.
1987	80	12.00	4.00	14.00	------	12.88	3.96	6.67	------	Wheat and corn product.
1985	80	12.00	4.00	14.00	------	10.88	3.82	6.05	------	do.
1991	80	14.50	4.00	8.00	------	------	------	------	------	Wheat bran and corn product.
2798	80	14.50	4.00	8.00	------	13.25	3.26	3.55	------	Wheat bran and corn bran.
2862	80	10.00	3.75	12.00	------	9.50	3.27	8.50	------	Wheat product, containing ground corn cobs.
2734	------	9.75	3.50	11.97	------	10.75	3.15	10.12	------	do.
2692	100	10.00	3.50	11.97	------	10.38	3.08	8.02	------	Wheat and corn product, containing ground corn cobs.
2795	------	9.75	3.50	11.97	------	11.13	3.05	10.10	------	Wheat product, containing ground corn cobs.
2792	------	10.00	3.75	12.00	------	10.63	2.79	10.65	------	do.
2743	100	10.00	3.75	12.00	------	10.37	3.07	11.95	------	Wheat product and corn cobs.
2823	------	------	------	------	------	10.37	4.27	9.10	------	do.
2631	100	8.00	2.50	40.00	------	10.63	2.37	31.12	------	Cotton-seed hulls, sprinkled with cotton-seed meal.

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2871	Jersey Daisy Feed	Englewood Milling Co., Englewood, Tenn.	J. L. Smathers & Co., Murphy, N. C.	July 25, '08
2879	Feed	Glen Alpine Milling Co., Glen Alpine, N. C.		
1915	Mixed Feed	Glenn Anna Milling Co., Thomasville, N. C.		
2801	Corn Meal and Wheat Bran.	Grimes Bros., Lexington, N. C.		July 7, '08
1908	Feed	Koiner Flour Mills, Richmond, Va.		
2759	Mill Feed	J. M. Koiner, Grottoes, Va.	H. Schafer, Mt. Airy, N. C.	July 3, '08
1962	----do	Liberty Milling Co., Liberty, N. C.		
2773	Mixed Feed	J. A. Meadows & Co., New Bern, N. C.	J. A. Meadows & Co., New Bern, N. C.	July 1, '08
2658	Cow Feed	----do	----do	Mar. 18, '08
2659	Mixed Feed	----do	----do	Mar. 18, '08
2818	Feed	----do		
2802	Meal and Bran	Model Mills, Lexington, N. C.	G. W. Miller, Lexington, N. C.	July 7, '08
2869	Mixed Bran	J. L. Morgan, Clyde, N. C.	Feed and Lumber Co., Waynesville, N. C.	July 24, '08
2602	Mixed Feed	Newport Mill Co., Newport, Tenn.	J. Flem Johnson Co., Charlotte, N. C.	Feb. 11, '08
2613	----do	----do	Green Kincaid, Morganton, N. C.	Feb. 13, '08
1997	----do	----do	Adams Grain and Provision Co., Charlotte, N. C.	Feb. 11, '08
1993	----do	----do	I. Littmann, Salisbury, N. C.	Feb. 8, '08
2846	----do	----do	J. Flem Johnson, Gastonia, N. C.	July 13, '08
2845	----do	----do	Max Moses & Co., Concord, N. C.	July 9, '08
2804	----do	----do	H. G. White, Salisbury, N. C.	July 8, '08
2807	----do	----do	Kluttz Grain and Provision Co., Salisbury, N. C.	July 8, '08
2745	Red Dog Flour	The Northwestern Milling Co., Minneapolis, Minn.	P. R. Lamb & Co., Winston, N. C.	June 30, '08
1957	Cereola Cow Feed	Ralston Purina Co., St. Louis, Mo.		
1956	Star Feed	----do		
2601	Mill Feed	Riverside Milling and Power Co., Cartersville, Ga.	Adams Grain and Provision Co., Charlotte, N. C.	Feb. 11, '08
2737	Low Grade Wheat	Sheffield Mill and Elevator Co., Minneapolis, Minn.	J. H. Walker & Co., Reidsville, N. C.	June 29, '08
2678	Mixed Feed	Silk Hope Roller Mills, Siler City, N. C.	W. L. London & Son, Pittsboro, N. C.	April 13, '08
2817	Crushed Corn and Cob	South River Milling Co., Salisbury, N. C.		
2816	Crushed Corn and Cob and Wheat Bran.	----do		
2814	Wheat Screenings and Bran.	----do		
1969	Mixed Feed	Southside Mills, Winston-Salem, N. C.		
2661	Royal Feed	C. L. Spencer, New Bern, N. C.	C. L. Spencer, New Bern, N. C.	Mar. 18, '08
2861	Mixed Feed	E. F. Spears & Son, Paris, Ky.	S. K. Breeding & Co., Hendersonville, N. C.	July 22, '08
2874	Feed	----do		
2820	----do	----do		
2851	Mill Feed	Statesville Flour Mills, Statesville, N. C.	W. B. Palmer, Shelby, N. C.	July 15, '08
2610	----do	----do	Seltzer, Hickory, N. C.	Feb. 12, '08

OF MISCELLANEOUS FEEDS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
2871	75	15.00	4.00	8.00	------	15.38	4.11	6.40	------	
2879	------	------	------	------	------	14.25	5.05	7.55	------	
1915	------	------	------	------	------	11.75	3.48	4.42	------	Wheat and corn product.
2801	100	12.13	4.57	4.25	------	13.00	4.03	3.30	------	Wheat and corn feed.
1908	------	------	------	------	------	14.12	3.97	5.90	------	
2759	------	14.50	4.00	9.50	------	15.25	4.70	4.35	------	Wheat product.
1962	------	------	------	------	------	12.12	2.27	3.60	------	Wheat and corn product.
2773	100	11.00	4.00	4.50	------	8.00	4.35	2.80	------	Corn, oats and wheat bran.
2658	------	------	------	------	------	20.88	5.40	6.77	------	Wheat product, corn product and cotton-seed meal.
2659	------	------	------	------	------	9.25	4.14	4.80	------	Wheat, corn and oat feed.
2818	------	------	------	------	------	9.13	3.82	6.00	------	Wheat bran, oats and ground corn.
2802	100	12.00	3.50	4.00	------	11.25	4.05	4.70	------	Wheat bran and corn meal.
2869	------	------	------	------	------	12.88	4.65	8.32	------	Wheat and corn bran.
2602	80	13.00	4.00	8.00	------	14.13	5.74	6.10	------	do.
2613	80	13.50	4.00	8.00	------	14.50	4.87	6.45	------	do.
1997	80	13.00	4.00	8.00	------	14.88	5.87	6.47	------	do.
1993	80	13.00	4.00	8.00	------	15.12	5.19	6.30	------	do.
2846	------	13.00	4.00	8.00	------	14.75	5.41	5.85	------	do.
2845	------	13.50	4.00	8.00	------	13.13	5.33	5.85	------	do.
2804	80	13.50	4.00	8.00	------	11.63	4.09	3.57	------	do.
2807	------	13.00	4.00	8.00	------	13.75	5.25	6.00	------	do.
2745	------	18.25	5.25	2.50	------	17.62	5.66	1.55	------	Wheat product.
1957	------	------	------	------	------	15.81	5.41	18.50	------	Alfalfa, barley, corn product.
1956	------	------	------	------	------	12.38	5.10	11.32	------	Mostly cracked corn, alfalfa and barley.
2601	80	14.00	3.79	4.43	------	11.25	4.36	4.75	------	Wheat and corn product.
2737	------	------	------	------	------	17.62	5.51	1.45	------	Wheat product.
2678	100	14.50	4.00	8.00	------	13.75	3.64	3.75	------	Wheat and corn product, ground corn and cobs.
2817	----	------	----	------	------	7.87	4.10	7.00	------	Ground corn and cobs.
2816	------	------	------	------	------	9.75	3.39	9.00	------	Ground corn and cobs and wheat product.
2814	------	------	------	------	------	13.37	3.04	10.00	------	Wheat screenings and bran.
1969	------	------	------	------	------	11.31	3.48	4.33	------	Wheat and corn product.
2661	100	10.00	6.00	7.00	------	10.63	6.33	9.45	------	Whole oats, wheat and corn feed.
2861	100	16.00	4.00	------	------	14.50	4.90	7.30	------	Wheat bran and corn bran.
2874	----	------	------	------	------	14.13	4.92	7.65	------	Mostly a wheat product.
2820	----	------	------	------	------	14.75	4.70	9.00	------	Wheat product.
2851	80	14.00	4.00	6.00	------	14.75	3.55	6.22	------	
2610	100	15.50	3.80	5.99	------	15.25	4.71	7.55	------	

RESULTS OF THE EXAMINATION

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
1972	Mill Feed	Statesville Flour Mills, Statesville, N. C.		
1971	Mixed Corn and Wheat Bran.	----do		
1951	Bran and Shipstuff	----do		
2895	Feed	J. C. Thomas, Hiddenite, N. C.		
2736	----do	J. H. Walker & Co., Reidsville, N. C.	J. H. Walker & Co., Reidsville, N. C.	June 29, '08
2675	Cleanings from Wheat	Wachovia Mills, Winston-Salem, N. C.		
2764	Rye Middlings	Washburn-Crosby Co., Minneapolis, Minn.	W. B. Haymere, Mt. Airy, N. C.	July 3, '08
2758	Mixed Feed	----do	Piedmont Feed Co., North Wilkesboro, N. C.	July 2, '08
2757	----do	----do	The Forester Grocery Co., North Wilkesboro	July 2, '08
2756	----do	----do	E. B. Williams & Co., Wilkesboro, N. C.	July 2, '08

DISCUSSION

Eighty-eight (88) samples of miscellaneous feeds were examined. A critical

CRACKED CORN.

Much cracked corn has been offered for sale in this State which was made

RESULTS OF THE EXAMINA

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Date of Collection.
2712	Cracked Corn	B. D. Booth & Co., Petersburg, Va.		
2783	----do	City Hay and Grain Co., Elizabeth City, N. C.	City Hay and Grain Co., Elizabeth City, N. C.	July 17, '08
2776	----do	City Hay and Grain Co., Norfolk, Va.	E. R. Mixon Co., Washington, N. C.	July 14, '08
2648	----do	Concord Milling Co., Concord, N. C.		
2896	----do	Dabney Brokerage Co., Newport News, Va.		
2775	----do	----do	C. G. Morris & Co., Washington, N. C.	July 14, '08
2774	----do	----do	E. Peterson Co., Washington, N. C.	July 14, '08
2655	----do	Gambill & Davis, Roanoke, Va.	J. W. Brooks, Wilmington, N. C.	Mar. 17, '08
1914	----do	Lynchburg Milling Co., Lynchburg, Va.		
2777	----do	Mayo Milling Co., Richmond, Va.	Pamlico Grocery Co., Washington, N. C.	July 14, '08
2771	----do	S. D. Scott & Co., Norfolk, Va.	Burrus & Gray, New Bern, N. C.	July 11, '08
2767	----do	----do	Edwards & Pegram, Kinston, N. C.	July 10, '08
2819	----do	Tennessee Mill Co., Estill Springs, Tenn.		
2787	----do	W. S. White, Elizabeth City, N. C.	W. S. White & Co., Elizabeth City, N. C.	July 17, '08

DISCUSSION OF RESULTS.

Fourteen (14) samples of cracked corn were examined. Most of them are

OF MISCELLANEOUS FEEDS—CONTINUED.

Laboratory Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash.	Protein.	Fat.	Fiber.	Ash.	
1972	------	------	------	------	------	15.74	4.35	7.45	------	Wheat product.
1971	------	------	------	------	------	12.40	4.47	11.25	------	Wheat and corn product.
1951	------	------	------	------	------	16.37	4.68	7.63	------	Wheat product.
2895	------	------	------	------	------	12.50	3.73	3.97	------	
2736	------	12.75	4.00	7.50	------	10.75	3.77	6.70	------	Wheat and corn product.
2675	------	------	------	------	------	**14.63**	**3.13**	**11.50**	------	Wheat cleanings.
2764	------	------	------	------	------	15.50	4.10	5.70	------	Rye product.
2758	------	17.04	4.00	------	------	16.00	4.04	6.65	------	Wheat product.
2757	------	17.04	4.00	------	------	15.50	3.98	6.15	------	do.
2756	------	17.04	4.00	------	------	15.62	4.24	7.77	------	do.

OF RESULTS.

examination of the above table will reveal the true quality of these feeds.

from damaged corn. The results below will indicate the true quality of these products.

TION OF CRACKED CORN.

Laboratory. Number.	Claimed Weight of Package—lbs.	Claimed—per cent.				Found—per cent.				Ingredients.
		Protein.	Fat.	Fiber.	Ash	Protein.	Fat.	Fiber.	Ash.	
2712	------	------	------	------	------	8.00	2.85	1.80	------	Corn product.
2783	------	10.00	3.50	3.00	------	8.38	4.08	1.87	------	do.
2776	100	10.00	4.00	4.00	------	8.50	2.45	1.62	------	Cracked corn.
2648	------	------	------	------	------	8.25	4.43	2.39	------	Corn product.
2896	------	------	------	------	------	------	4.15	1.77	------	do.
2775	100	9.20	3.80	4.00	------	7.88	3.41	1.92	------	Cracked corn.
2774	100	9.20	3.80	4.00	------	8.25	3.97	2.10	------	do.
2655	80	10.00	4.50	1.50	------	8.75	3.89	2.20	------	do.
1914	------	------	------	------	------	9.62	4.60	2.87	------	Corn product.
2777	100	10.37	2.85	1.52	------	8.63	3.88	1.77	------	Cracked corn.
2771	100	10.00	4.00	4.00	------	8.13	3.29	1.67	------	Corn product.
2767	------	10.00	4.00	4.00	------	8.12	4.19	6.15	------	do.
2819	------	------	------	------	------	8.25	4.40	2.00	------	Cracked corn.
2787	100	10.00	4.00	4.00	------	7.63	4.12	1.70	------	do.

guaranteed too high in protein and fat, as only one or two come up to their guarantee in either protein or fat.

THE MICROSCOPIC EXAMINATION OF FEEDS.

It was not possible to make chemical analyses of all samples collected, but

MICROSCOPIC

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.
213 M	Bran	Crown Milling Co., Ashboro, N. C.
214 M	----do	Southern Mills, Nashville, Tenn.
215 M	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.
216 M	Bran	J. A. Tate, Greensboro, N. C.
217 M	----do	Holt-Granite Mfg. Co., Haw River, N. C.
218 M	----do	Piedmont Mills, Lynchburg, Va.
219 M	Shipstuff	Carrolina Roller Mills, Durham, N. C.
220 M	Mill Feed	----do
221 M	Shipstuff	----do
222 M	Mill Feed	Aberdeen Power and Milling Co., Aberdeen, N. C.
223 M	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.
224 M	----do	Tennessee Mill Co., Estill Springs, Tenn.
225 M	----do	----do
226 M	----do	Dan Valley Mills, Danville, Va.
227 M	Middlings	The Dunlop Milling Co., Clarksville, Tenn.
228 M	Bran	Piedmont Mills, Lynchburg, Va.
229 M	Shipstuff	Dan Valley Mills, Danville, Va.
230 M	Bran	----do
231 M	Shipstuff	----do
232 M	Bran	Tennessee Mill Co., Estill Springs, Tenn.
233 M	----do	The Dunlop Milling Co., Clarksville, Tenn.
234 M	Shipstuff	Piedmont Mills, Lynchburg, Va.
235 M	Middlings	H. S. Holliday Milling Co., Cairo, Ill.
236 M	Bran	J. H. Walker & Co., Reidsville, N. C.
237 M	Middlings	H. S. Holliday Milling Co., Cairo, Ill.
238 M	Bran	F. L. Moses & Bro., Chatham, Va.
239 M	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.
240 M	----do	Dan Valley Mills, Danville, Va.
241 M	----do	J. Allen Smith & Co., Knoxville, Tenn.
242 M	Daisy Middlings	Pillsbury Mills, Minneapolis, Minn.
243 M	Shipstuff	Dan Valley Mills, Danville, Va.
244 M	----do	J. Allen Smith & Co., Knoxville, Tenn.
245 M	----do	Dunlop Mills, Richmond, Va.
246 M	Brown Shorts	Atlanta Milling Co., Atlanta, Ga.
247 M	Shorts	Tennessee Mill Co., Estill Springs, Tenn.
248 M	Daisy Middlings	Pillsbury Mills, Minneapolis, Minn.

microscopic examinations were made of all samples. The results of the microscopic examination of samples are brought together below:

EXAMINATION.

Laboratory Number.	Retail Dealer.	Ingredients.
213 M	Sent in by mill	Wheat product, large per cent trash.
214 M	Carolina Feed Store, Raleigh, N. C.	Wheat product.
215 M	Phillips & Penny, Raleigh, N. C.	Wheat and corn product.
216 M	W. A. Myatt, Raleigh, N. C.	Wheat product.
217 M	----do	Wheat bran and cracked wheat.
218 M	C. A. Norris & Co., Raleigh, N. C.	Wheat product.
219 M	E. D. Nall, Sanford, N. C.	
220 M	----do	Wheat and corn product.
221 M	J. A. McIver, Jonesboro, N. C.	
222 M	H. D. Baldwin, Rockingham, N. C.	Mostly corn bran, with wheat product.
223 M	C. L. Kell, Hamlet, N. C.	Wheat and corn product.
224 M		Wheat product.
225 M	Helms, Richardson & Co, Monroe, N. C.	do.
226 M	R. G. Hiatt, Greensboro, N. C.	do.
227 M	J. R. Chismen & Bros., Greensboro, N. C.	do.
228 M	Sockwell Bros., Greensboro, N. C.	do.
229 M	----do	do.
230 M	J. W. Jones & Bro., Greensboro, N. C.	do.
231 M	----do	do.
232 M	R. G. Hiatt, Greensboro, N. C.	do.
233 M	----do	do.
234 M	The Patterson Co., Greensboro, N. C.	do.
235 M	W. A. Stacy, Reidsville, N. C.	
236 M	J. H. Walker & Co., Reidsville, N. C.	Wheat product.
237 M	Hutcherson Bros., Reidsville, N. C.	
238 M	----do	Wheat product.
239 M	S. A. Pfaff, Salem, N. C.	Wheat and corn product.
240 M	Cromer Bros. Co., Winston, N. C.	Wheat product.
241 M	P. R. Lamb & Co., Winston, N. C.	Wheat and corn product.
242 M	Standard Feed and Seed Co., Winston, N. C.	
243 M	C. F. Bennett & Bro., Durham, N. C.	Wheat product.
244 M	Allen-Owens Co., Durham, N. C.	Wheat and corn product.
245 M	----do	do.
246 M	Markham-Stephens Co., Durham, N. C.	
247 M	E. B. Williams & Co., Wilkesboro, N. C.	Wheat product.
248 M	E. G. Bowman, Mount Airy, N. C.	

MICROSCOPIC EXAM

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.
249 M	Bran	Washburn-Crosby Co., Louisville, Ky.
250 M	----do	J. H. Walker & Co., Reidsville, N. C.
251 M	----do	J. Allen Smith & Co., Knoxville, Tenn.
252 M	Shorts	Southern Mills, Nashville, Tenn.
253 M	Shipstuff	Dunlop Mills, Richmond, Va.
254 M	Feed	Northwestern Consol. Milling Co., Minneapolis, Minn.
255 M	Middlings	Washburn Mills, Minneapolis, Minn.
256 M	Shipstuff	Dunlop Mills, Richmond, Va.
257 M	Bran and Shorts	Model Mills, Lexington, N. C.
258 M	Wheat Bran	Asheville Milling Co., Asheville, N. C.
259 M	Bran	Piedmont Mills, Lynchburg, Va.
260 M	Cracked Corn	E. T. Jennett, Washington, N. C.
261 M	Corn Chops	Boney & Harper, Wilmington, N. C.
262 M	Cracked Corn	Dabney Brokerage Co.
263 M	Bran	Washburn-Crosby Co., Louisville, Ky.
264 M	Shorts	Liberty Mills, Nashville, Tenn.
265 M	Shipstuff	Dunlop Mills, Richmond, Va.
266 M	Middlings	The Dunlop Milling Co., Clarksville, Tenn.
267 M	Bran	Watson Mills, Wichita, Kansas
268 M	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.
269 M	Bran	----do
270 M	Shipstuff	Concord Milling Co., Concord, N. C.
271 M	----do	The Mountain City Mill Co., Chattanooga, Tenn.
272 M	----do	Concord Milling Co., Concord, N. C.
273 M	----do	J. D. Manor, New Market, Va.
274 M	Bran	Concord Milling Co., Concord, N. C.
275 M	----do	Star Mills, Nashville, Tenn.
276 M	Mill Feed	Statesville Milling Co., Statesville, N. C.
277 M	Shipstuff	Mountain City Mill Co., Chattanooga, Tenn.
278 M	----do	Tennessee Mill Co., Estill Springs, Tenn.
279 M	Bran	----do
280 M	Acme Feed	
281 M	Wheat Bran	Asheville Milling Co., Asheville, N. C.
282 M	Shipstuff	Mountain City Mill Co., Chattanooga, Tenn.
283 M	Bran	Read Bros., Morristown, Tenn.
284 M	Shorts	----do
285 M	Shipstuff	Mountain City Mill Co., Chattanooga, Tenn.
286 M	Bran	Star Mills, Nashville, Tenn.

INATION—CONTINUED.

Laboratory Number.	Retail Dealer.	Ingredients.
249 M	W. B. Haymore, Mount Airy, N. C.	Wheat product.
250 M	C. L. Marshall, Mount Airy, N. C.	do.
251 M	Burrus & Gray, New Bern, N. C.	do.
252 M	W. H. Turner, Winston, N. C.	do.
253 M	----do	do.
254 M	----do	
255 M	The Patterson Co., Greensboro, N. C.	Wheat product.
256 M	Parker & Johnson, High Point, N. C.	do.
257 M	B. H. Finch, Lexington, N. C.	do.
258 M	W. W. Upchurch, Raleigh, N. C.	Wheat and corn product.
259 M	Best & Thompson, Goldsboro, N. C.	Wheat product.
260 M	Mayo Milling Co., Richmond, Va.	Corn product.
261 M	Brooks & Taylor, Wilmington, N. C.	do.
262 M	The Worth Co., Wilmington, N. C.	do.
263 M	B. F. Mitchell, Wilmington, N. C.	Wheat product.
264 M	C. Woodward Co., Wilson, N. C.	do.
265 M	R. B. Peters Grocery Co., Tarboro, N. C.	do.
266 M	Hales & Edwards, Rocky Mount, N. C.	do.
267 M	Matthews, Weeks & Co., Rocky Mount, N. C.	do.
268 M	----do	Wheat and corn product.
269 M	Burrus & Gray Co., New Bern, N. C.	Wheat product.
270 M	H. L. Park & Co., Concord, N. C.	do.
271 M	H. M. Blackwelder, Concord, N. C.	Wheat and corn product.
272 M	----do	Wheat product.
273 M	----do	
274 M	----do	Wheat product.
275 M	Cothran-McLaughlin Co., Charlotte, N. C.	do.
276 M	W. F. Redmond, Charlotte, N. C.	Wheat and corn product.
277 M	----------	do.
278 M	G. G. Hyder, Hendersonville, N. C.	Wheat product.
279 M	----do	do.
280 M	Burkmeyer Bros., Hendersonville, N. C.	Wheat and corn product.
281 M	----------, Greensboro, N. C.	do.
282 M	S. K. Breeding & Co., Hendersonville, N. C.	Wheat and corn product, mostly corn bran.
283 M	Seigler & Co., Asheville, N. C.	Wheat product.
284 M	Allison & Jennette, Asheville, N. C.	
285 M	Asheville Grocery Co., Asheville, N. C.	Corn and wheat product, mostly corn bran.
286 M	----do	Wheat product.

MICROSCOPIC EXAM

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.
287 M	Bran	Tennessee Mill Co., Estill Springs, Tenn.
288 M	Shipstuff	----do
289 M	----do	Mountain City Mill Co., Chattanooga, Tenn.
290 M	Bran	Asheville Milling Co., Asheville, N. C.
291 M	Mixed Bran	J. L. Morgan, Clyde, N. C.
292 M	Middlings	----do
293 M	Shipstuff	J. Allen Smith & Co., Knoxville, Tenn.
294 M	Shorts	Star Mills, Nashville, Tenn.
295 M	Bran	Glen Alpine Milling Co., Glen Alpine, N. C.
296 M	Shipstuff	The Dunlop Milling Co., Richmond, Va.
297 M	Wheat Bran	J. D. Pitts, Glen Alpine, N. C.
298 M	Shorts	----do
299 M	Feed	----do

MISCELLANEOUS MICRO

1	A	Corn Meal	
2	A	Bran	
3	A	Cracked Corn	
6	A	Corn Product	
7	A	Feed	
8	A	Cracked Corn	
9	A	Feed	Asheville Milling Co., Asheville, N. C.
10	A	----do	
11	A	International Stock Food	
12	A	Victor Feed	Peters & Bradley Mill Co., Knoxville, Tenn.
13	A	Feed	
14	A	Bran	
15	A	Shorts	
16	A	Bran, Shorts and Screenings	
17	A	Bran	Hiddenite Roller Mills, Hiddenite, N. C.
18	A	Middlings	
19	A	----do	
20	A	----do	

DISCUSSION

The inspection of the above table will

INATION—CONTINUED.

Laboratory Number.		Retail Dealer.	Ingredients.
287	M	Asheville Grain and Feed Co., Asheville, N. C.	Wheat product.
288	M	----do	do.
289	M	----do	Wheat and corn product, mostly corn bran.
290	M	J. L. Smathers & Co., Murphy, N. C.	Wheat and corn bran.
291	M	C. H. Ray, Waynesville, N. C.	do.
292	M	----do	do.
293	M	C. L. Lewis, Brevard, N. C.	Wheat and corn product.
294	M	Mitchell Bros., Brevard, N. C.	Wheat product.
295	M	J. A. Shupsing, Morganton, N. C.	do.
296	M	J. K. Morrison & Son, Statesville, N. C.	do.
297	M	Sent in by mill	do.
298	M	----do	do.
299	M	----do	Wheat product and screenings.

SCOPIC EXAMINATIONS.

1	A	W. W. Graham, Oxford, N. C.	Corn product.
2	A	----do	Wheat product.
3	A	R. B. Peters Grocery Co., Tarboro, N. C.	Corn, wheat, oats and trash.
6	A	A. E. Sides, Mt. Airy, N. C.	Corn product.
7	A	A. H. Vann, Franklinton, N. C.	Wheat product.
8	A	B. D. Booth, Petersburg, Va.	Corn product.
9	A	W. W. Upchurch, Raleigh, N. C.	Wheat and corn bran.
10	A	J. H. Morrow, Cherryville, N. C.	Wheat product and corn cobs.
11	A	P. B. Johnson, Benson, N. C.	Wheat product, oil meal, red pepper, gentian, salt, weed seed.
12	A	Sent in by manufacturer	Corn, oats, oat hulls, cotton-seed meal, wheat product.
13	A	Davis Bros., Hiddenite, N. C.	Wheat product.
14	A	J. D. Pitts, Glen Alpine, N. C.	do.
15	A	----do	do.
16	A	----do	Wheat product and screenings.
17	A	Sent in by manufacturer	Wheat product.
18	A	Adams Grain and Provision Co., Fayetteville, N. C.	do.
19	A	----do	do.
20	A	----do	do.

OF RESULTS.

reveal the components of these feeds.

ADULTERANTS.

When mixed with good feeding materials, without proper labeling or guarantee to indicate their presence, corn bran, rice chaff, ground corn cobs, peanut hulls, peanut middlings, oat hulls, oat dust, mill sweepings, screenings, cotton-seed hulls, and other similar products are adulterants. The tables containing the chemical and microscopical examinations show that these adulterants were used to a considerable extent in the make-up of the feeds sold for stock in the State prior to the enforcement of the present feed law. To convey an idea of the real feeding value of these adulterants the following analyses were made:

	Per Cent Protein.	Per Cent Fat.	Per Cent Ash.	Per Cent Fiber.
Peanut Hulls	4.56	.81	2.17	67.31
Peanut Middlings	8.75	.88	16.75	40.75
Ground Corn Cobs	3.12	.32	2.19	30.37
Rice Chaff	2.50	.31	18.37	34.40
Oat Hulls	3.03	1.06	6.70	29.07
Oat Dust	8.09	5.01	6.09	1.82
Wheat Screenings	9.08	2.02	2.90	3.00
Corn Bran	9.00	5.08	1.30	12.70
Cotton-seed Hulls	4.75	1.59	3.20	40.54

SUMMARY.

Wheat Bran and Mixed Brans.—Fifty-one (51) samples of pure wheat bran and mixed brans were examined. Thirteen (13) samples were below the guarantee in protein.

Middlings or Shorts.—Fifty (50) samples of middlings or shorts were examined, and all were found to be pure wheat products. Fifteen (15) were below the standard of fifteen (15) per cent protein.

Bran and Shorts.—Fifteen (15) samples of bran and shorts were examined. All were found to be pure wheat products. Six (6) samples were below their guaranteed analysis. Three (3) were below the standard of 14.50 per cent protein.

Shipstuff. Forty-seven (47) samples of shipstuff were examined. Twenty-one (21) were pure wheat products. Twenty-six (26) were mixtures.

Corn and Oat Feeds.—Twelve (12) samples of corn and oat feeds were examined. Eight of these samples contained less than 10 per cent protein, and are therefore low grade.

Rice Feeds.—Seven (7) samples of rice feeds were examined. These feeds vary very much in composition and should be purchased according to the analysis they bear.

Molasses Feeds.—Thirteen (13) samples of molasses or sugar feeds were examined. These feeds vary in quality, due to difference in composition.

Beet Pulp.—Two (2) samples of beet pulp were examined. The analyses of this product will reveal its nutritive value.

Hominy Feeds and Chops.—Fourteen (14) samples of hominy feeds and chops were examined. Samples 2893 and 2894 are not chops, but wheat products.

Cotton-seed Feeds.—Three (3) samples of cotton-seed feeds were examined. These samples are guaranteed to contain twenty-two (22) per cent protein.

Special Mixed Feeds.—Eighteen (18) samples of special named feeds were examined. Most of these feeds are of good quality.

Miscellaneous Feeds.—Eighty-eight (88) samples of miscellaneous feeds were examined. The analyses of these products will reveal their nutritive value.

Cracked Corn.—Fourteen (14) samples of cracked corn were examined. Some of the samples of cracked corn were made from damaged corn.

Miscellaneous Feeds Examined Microscopically.—One hundred and five (105) samples of feeds were examined microscopically. An examination of the column marked "Ingredients" will show the material of which these feeds are composed.

Fifty-four (54) samples of cotton-seed meals were examined. Eighteen and a half ($18\frac{1}{2}$) per cent were found to contain less than 7½ per cent ammonia.

INSPECTION AND ANALYSES OF COTTON-SEED MEAL.

The cotton-seed meal law of this State requires that all cotton-seed meal sold in the State shall contain 7½ per cent ammonia or more. Fifty-four (54) samples of cotton-seed meals have been examined. The samples have been secured in different parts of the State, at different times, and represent the quality of this product that is offered for sale in this State. Ten (10) of the samples examined, or 18.5 per cent, were below the standard of 7½ per cent ammonia. The samples below 7½ per cent ammonia appear in black type.

Discussion of Results.—Good grades of cotton-seed meal contain 43 per cent or more of protein. This means that they have about 7 per cent of nitrogen, which is equal to 8.50 per cent ammonia.

ANALYSES OF COTTON-SEED MEAL.

Laboratory Number.	Name and Address of Manufacturer.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.	Per Cent Protein Found.
2309	Battleboro Oil Co., Battleboro, N. C.		8.12	41.81
2314	----do		8.00	41.19
2321	----do		7.98	41.06
2312	----do		7.90	40.68
2326	----do		7.80	39.72
2313	----do		7.76	39.93
2380	----do		7.64	39.31
2315	----do		**7.00**	36.06
2338	Bragaw, William, & Co., Washington, N. C.	7.50	8.40	43.25
2362	Chatham Cotton Oil Co., Pittsboro, N. C.	7.50	7.67	39.50
2363	----do	7.50	8.18	42.12
2366	Consumers Cotton Oil Co., Tarboro, N. C.	7.50	8.06	41.50
2367	Cotton Oil Ginning Co., Scotland Neck, N. C.	7.50	8.67	44.62
2343	Eastern Cotton Oil Co., Hertford, N. C.	7.50	**7.42**	38.19
2340	----do	7.50	7.70	39.62
2364	Elba Manufacturing Co., Charlotte, N. C.	7.50	7.72	39.75
2358	----do	7.50	8.38	43.12
2303	Fremont Oil Mill Co., Fremont, N. C.		8.00	41.19
2372	Georgia Cotton Oil Co., Atlanta, Ga.	7.50	7.82	40.25
2336	Havens' Oil Mill, Washington, N. C.	7.50	8.04	41.37
2297	Kings Mountain Cotton Co., Kings Mountain, N. C.		8.88	45.68
2368	Laurinburg Oil Co., Laurinburg, N. C.	7.50	8.21	42.25
2365	----do		7.96	41.00
2386	----do		7.60	39.12
2289	----do		**7.46**	38.72
2302	----do		8.00	41.19
2290	Lenoir Oil and Ice Co., Kinston, N. C.		8.18	42.12
2317	----do		8.04	41.37
2304	----do		7.96	41.00
2324	----do		7.80	39.72
2323	----do		7.76	39.93
2291	Morgan Oil and Fertilizer Co., Red Springs, N. C.		**7.32**	37.68
2337	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	7.50	8.08	41.56
2320	North Carolina Cotton Oil Co., Henderson, N. C.	7.50	**6.82**	35.12
2335	----do	7.50	**7.28**	37.50
2288	Pine Level Oil Mills Co., Pine Level, N. C.		7.56	38.94
2319	----do		8.38	43.12
2341	Pitt County Oil Co., Winterville, N. C.	7.50	7.64	39.31

ANALYSES OF COTTON-SEED MEAL—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Per Cent Ammonia Guaranteed.	Per Cent Ammonia Found.	Per Cent Protein Found.
2311	Rowland Oil and Fertilizer Co., Rowland, N. C.		7.50	38.44
2357	Southern Cotton Oil Co., Charlotte, N. C.	7.50	7.84	40.37
2356	----do	7.50	**7.33**	37.75
2295	Southern Cotton Oil Co., Concord, N. C.	7.50	8.18	42.12
2369	Southern Cotton Oil Co., Goldsboro, N. C.	7.50	8.28	42.62
2339	Southern Cotton Oil Co., Rocky Mount, N. C.	7.50	**7.30**	37.56
2344	Southern Cotton Oil Co., Tarboro, N. C.	7.50	**7.00**	36.06
2359	Southern Cotton Oil Co., Wilson, N. C.	7.50	8.12	41.81
2361	Southern Cotton Oil Co., Wilmington, N. C.	7.50	**7.45**	38.37
2331	Speed Milling Co., Speed, N. C.		8.04	41.37
2294	Statesville Oil and Fertilizer Co., Statesville, N. C.	7.50	8.30	42.75
2342	Tar River Oil Co., Tarboro, N. C.	7.50	8.38	43.12
2371	Virginia-Carolina Chemical Co., Richmond, Va.	7.50	8.01	41.23
2325	Verner Oil Co., Lattimore, N. C.		8.38	43.62
2292	----do		7.98	41.06
2318	Wells, J. Lindsay, & Co., Memphis, Tenn.		8.60	44.25

INSPECTION AND ANALYSIS OF COTTON-SEED MEAL.

An Act to Regulate the Sale and Inspection of Cotton-seed Meal.

[Chapter 267, Laws 1905.]

The General Assembly of North Carolina do enact:

Section 1. That chapter three hundred and thirty-nine (339) of the Public Laws of one thousand nine hundred and three (1903), entitled "An act to regulate the sale, inspection and branding of cotton-seed meal," be amended so as to read as follows:

Sec. 2. That all cotton-seed meal sold for use as fertilizer or feed shall be subject to an inspection tax of twenty cents per ton, and be subject to inspection, as other fertilizers or fertilizing materials, unless sold to manufacturers for use in manufacturing fertilizers.

Sec. 3. That all cotton-seed meal offered for sale, unless sold to manufacturers for use in manufacturing fertilizers, shall have plainly branded on the bag containing it, or on a tag attached thereto, the following data:

1. Cotton-seed meal with bran.
2. Weight of package.
3. Ammonia or nitrogen.
4. Name and address of manufacturer.

Sec. 4. That no person or persons, firm or corporation shall offer for sale any cotton-seed meal, except as provided in section three of this act, with a minimum per cent of ammonia of less than seven and one-half (7½) per cent. Meal containing seven and one-half (7½) per cent or more of ammonia is standard meal, and may be so branded. Meal containing eight (8) per cent or more of ammonia is high-grade meal, and may be so branded.

Sec. 5. That the State Board of Agriculture is empowered and directed to make such rules and regulations as are necessary to a proper carrying into effect the provisions of this act, and to provide for all such tags as manufacturers may demand, upon paying the tax therefor. Any person willfully violating any of the regulations made by the Board of Agriculture in connection with this act shall be guilty of a misdemeanor. Any person or persons, firm or corporation who shall sell or offer for sale any cotton-seed meal without having the proper tax tags attached thereto, or who shall use the required tags the second time to avoid the payment of the tonnage charge, and every person who shall remove any such meal, shall be liable to a penalty of ten dollars ($10) for each separate bag, barrel or other package sold or offered for sale or removed, to be recovered by any person who may sue for the same.

Sec. 6. That any person or persons, firm or corporation who shall sell or offer for sale any cotton-seed meal contrary to the provisions above set forth shall be guilty of a misdemeanor, and all cotton-seed meal so sold or offered for sale shall be subject to seizure, condemnation and sale by the Commissioner of Agriculture. Such seizure and sale shall be made under the direction of the Commissioner of Agriculture by an officer or agent of the department; the sale to be made at the courthouse door in the county in which the seizure is made, after thirty (30) days' advertisement in some newspaper published in

said county, or if no newspaper is published in said county, then by like advertisement in a newspaper published in the nearest county thereto having a newspaper. The advertisement shall state the grade of the meal, the quantity, why seized and offered for sale. The Commissioner, however, shall have the discretion to release the meal so seized and condemned upon compliance with the law as set forth above and the payment of all costs and expenses incurred by the department in any proceedings connected therewith. The net proceeds from such sale shall be placed in the general fund of the department and accounted for upon its books.

SEC. 7. Whenever the Commissioner of Agriculture shall be satisfied that any cotton-seed meal is essentially below the guaranteed analysis it shall be his duty to assess said deficiency against the manufacturer of the meal and require that the value of said deficiency be made good to all persons who, in the opinion of the Commissioner, have purchased the said meal; and the Commissioner may seize any meal belonging to said company, to the value of the deficiency, if the deficiency shall not be paid within thirty (30) days after notice to the company. If the Commissioner shall be satisfied that the deficiency in analysis was due to intention or fraud of the manufacturer, then the Commissioner shall assess and collect from the manufacturer twice the amount of the deficiency and pay over the same to parties who purchased said meal. That if any manufacturer shall resist such collection or payment the Commissioner shall immediately publish the analysis and the facts in THE BULLETIN and in such newspapers in the State as he may deem necessary.

SEC. 8. It shall be unlawful for any manufacturer to adulterate cotton-seed meal in the process of manufacture or otherwise.

SEC. 9. This act shall be in force from and after July first, nineteen hundred and five (1905).

In the General Assembly read three times, and ratified this the 17th day of February, A. D. 1905.

STARCHES USED IN COTTON MILLS, AND THEIR ADULTERATION.

By C. D. Harris, Assistant State Chemist.

INTRODUCTION.

Early in June two samples of starch were sent to this Laboratory for examination. One sample was represented to be potato starch and the other corn starch.

The corn starch was found to be as represented, but very little potato starch was found in the sample represented to be potato starch. The product was mainly corn starch.

This led to the belief that perhaps a mixture of corn and potato starch was being sold for pure potato starch.

After some correspondence with the sender of these samples as to their price and use, it was decided to investigate the quality of the different starches offered for sale in this State.

With this object in view, the following circular-letter was sent out to about eighty weaving mills:

Dear Sir:—We desire to make an investigation of the kinds and quality of the different starches used in cotton mills in this State, for the benefit of the cotton mills.

We would appreciate it very much if you will send us a ¼-pound sample of each kind of starch used in your mill.

Please send in a sealed package, stating on the package kind of starch, name and address of manufacturer, your own name and address, or mill name and location, price per pound, and as near as you can the number of pounds used annually of the different kinds of starches in your mill or mills.

The replies showed much interest and a willingness to co-operate in the investigation. In a short while many samples of starch were received.

The samples were examined both chemically and microscopically, the following objects being in view:

First. To determine whether or not the starch was the kind it was claimed to be.

Second. To determine if any mineral matter, such as talc, tremolite, ground soapstone, plaster of paris, or china clay, etc., had been added to give weight.

Third. To determine if there existed any difference in the gluten content of the different kinds of starch and different samples of the same kind of starch.

Fourth. To determine whether the samples were neutral, acid, or alkaline.

CONSUMPTION OF STARCH IN NORTH CAROLINA.

It is estimated that about 300 pounds of starch per loom are used in North Carolina annually.

There are 52,747 looms operated in the State; therefore, there are about 15,824,100 pounds of starch consumed by the cotton-weaving mills alone.

Reckoning the average price of all starch consumed at 2½ cents per pound, it is found that about $400,000 is spent every year for starch in this State. The economical expenditure of so large a sum of money is worth considering.

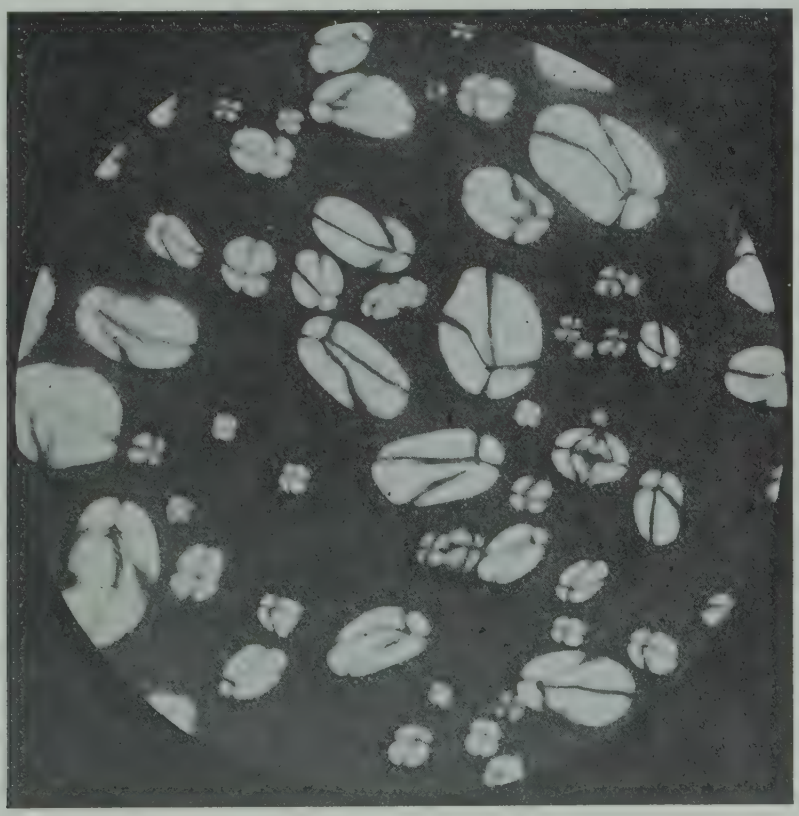
FRAUDS PRACTICED.

The fact that it is impossible to tell the difference between different kinds of starches without the aid of the microscope has been taken advantage of by some manufacturers or dealers to deceive purchasers as to the actual composition of the product.

How long the fraud of substituting a cheaper form of starch for a more expensive one has been going on we have no way of knowing.

How much money consumers of starch have lost by this deception on the part of manufacturers or dealers cannot be estimated.

The fact that 66 per cent of the so-called potato starches examined were found to be mainly corn starch or cassava starch will give some idea of the magnitude of the sophistication.



Pure Potato Starch. Magnified 200 times.

This Department is willing and stands ready to be of any service it can to the textile manufacturers of the State to put an end to the adulteration of starches.

It does not mean to interfere in any way with legitimate trade.

PROPERTIES OF STARCH.

Occurrence.—Starch is one of the most widely-diffused substances in the vegetable kingdom, occurring more or less abundantly in every plant that has up to the present time been examined.

It is found in different parts of the plants, especially in the seeds of all the cereals and in the tubers of the potato, canna, and cassava.

Starch is found in varying proportions in different parts of the same plant. For instance, it is found in green leaves of all plants during the daytime; the proportion varying according to the weather and time of day. It is generally present in greatest quantity toward the evening and least in the morning, whilst during the night the starch completely disappears from the leaves, especially during the summer months.

Starch is also found in the pith of trees and shrubs and in the various woody tissues, but its presence in these parts, as in the leaves, is not constant, the same tissues at certain seasons being fully charged with starch and at others almost entirely devoid of it.

Nomenclature.—In this country the term starch appears to be applied generally to that obtained from all sources, with the name of the substance from which it is made usually prefixed to it, such as potato starch, wheat starch, rice starch.

In a few instances the affix "starch" is dropped, as in "sago," "arrowroot," or the product is known by some name given it in commerce, as "tapioca," etc.

RELATIVE PROPORTION OF STARCH IN VARIOUS PLANTS.

The per cent of starch in various plants differs, as seen in table below:

	Per Cent Starch.
Potato, air-dried	16–23
Corn	55–67
Wheat	53–56
Barley	38–46
Oats	27–38
Rye	45–47
Rice	75–77
Buckwheat	44
Tubers of Yam	25.2
Dried Apples	5.2
Dried Pears	10.3
Pease	38

Physical Characteristics.—To the naked eye pure starch presents the appearance of a white glistening friable powder, having a harsh feel when rubbed between the fingers, perfectly neutral, without taste or smell, is uncrystallizable and undergoes no change under ordinary atmospheric conditions.

Under Microscope.—Under the microscope it is seen to consist of granules of various forms; the granules are, in most cases, perhaps, more or less ovoid and differing widely in size, form and appearance, dependent upon the source from which they are derived.

These starch granules may vary in size from 0.002 mm. in diameter to 0.185 mm.

These wide differences are the principal means by which the various kinds of starch may be differentiated one from another as they occur in commerce.

It must be noted, however, that the size of the starch granules varies very greatly in different plants, being in some immeasurably minute, as in certain species of cacti; in others, as in the potato, attaining a comparatively very large size.

In the same plant and often in the same cell the size of the starch granules will be found to vary, being chiefly dependent upon the relative age of the grains, so that when measures of starch grains from various sources are given they must be taken only to represent an average; but although the dimensions of the starch granules produced by one species of plant are by no means constant, yet none of them depart very widely from the average, and so can be readily differentiated microscopically one from another by an expert.

DIAMETER OF COMMON VARIETIES OF STARCH GRANULES.

	Millimeter.	*Inch.*
Tubers of Potato	0.140	0.0055
Wheat	.050	.0019
Corn	.030	.0012
Tapioca	.028	.0011
Buckwheat	.009	.00035
Rice	.022	.0008
Barley	.025	.00098

Under Polarized Light.—Starch assumes under polarized light a most characteristic appearance.

When examined with polarized light the field remains dark, but each granule assumes a glistening gray appearance, as if self-illuminous, and is marked with a black cross. If a thin plate of selenite be introduced between the polarizer and the objective while the prisms are crossed, beautiful chromatic effects may be obtained.

Chemical Properties.—Starch is insoluble in cold water, alcohol, ether, or any other known solvent.

Ordinarily air-dried starch usually contains 18 per cent of water, which can be driven off by heating to 100 degrees C. Under this condition starch appears to be a most highly hygroscopic substance which rapidly absorbs moisture from the air until it regains its original 18 per cent, and if exposed to damp atmosphere it is capable of absorbing as much as 35 per cent of moisture.

Action of Heat on Starch.—Freed completely from moisture, starch may be heated to a temperature of 160 degrees C., without undergoing any change; at temperatures higher than this it becomes colored and is partly converted into dextrine.

If ordinarily air-dried starch be heated to 160 degrees C., it quickly undergoes decomposition, becoming converted into dextrine and reducing sugars.

Potato starch is entirely decomposed under these conditions.

Action of Hot Water.—When starch is brought in contact with hot water, the contents of the granules, owing to a large absorption of water, swell up enormously, and at a temperature varying according to the variety of starch, ultimately rupture the outer layer, forming a viscous liquid which is known as starch paste.

The different varieties of starch gelatinize with hot water at very different temperatures, as seen in the following table by Lintner, which gives the temperatures of complete gelatinization for the common varieties of starch:

TEMPERATURE AT WHICH COMPLETE GELATINIZATION TAKES PLACE.

	Degrees C.
Potato	65
Corn	75
Wheat	80
Barley	80
Rice	85

Under the action of boiling water the starch granules do not all swell up and burst at once, the younger ones being attacked first, the older last.

According to Brown and Heron, starch which has been treated with dilute potash and acid in the process of purification produces a paste of less viscosity than the same starch which has not been so treated. They also find that immense variations in the consistency of the resulting paste are produced by slightly altering the manner of drying.

Thus starch which has been dried slowly and at a low temperature yields a more viscous solution than if dried quickly at a higher temperature.

From the manufacturer's point of view the viscosity of starch is most important, as the value of starch in certain industries depends entirely upon the viscosity produced by it when acted on by boiling water.

Potato starch is used in large quantities for the sizing and stiffening of yarn cloth, so that it is of importance to the manufacturer to obtain that sample of starch which will make the stiffest cloth and which has the greatest tenacity.

Viscosity of Starch Important to Manufacturers.—If the viscosity of one sample of starch is 18 and the other 28, it means that it requires 28 pounds of one sample to give the same stiffness as 18 pounds of the other.

Action of Alkalies on Starch.—When starch is treated with an alkaline solution, the granules swell and form an exceedingly tough viscous mass.

Action of Acids.—A swelling of the starch granules similar to that occasioned by sodium, or potassium hydroxide is produced immediately by all mineral acids and by some organic acids—tartaric and citric—after being in contact for some time. No swelling is produced by acetic or oxalic acid, no matter how concentrated their solutions may be.

Chemical Composition.—Although starch from different plants has the same percentage composition (the formula being $C_6H_{10}O_5$ or some multiple), it is not one single substance.

Three isomeric carbohydrates occurring in varying proportions have been described:

(1) Granulose colored blue with iodine.

(2) Starch cellulose colored yellow with iodine, and

(3) Amylodextrine colored red with iodine.

True starch consists of granulose with a small amount of starch cellulose, and is colored blue by iodine.

Starch is converted into a paste by boiling with water, passing successively into soluble starch, dextrine, and dextrose on boiling with dilute sulphuric acid or hydrochloric acid.

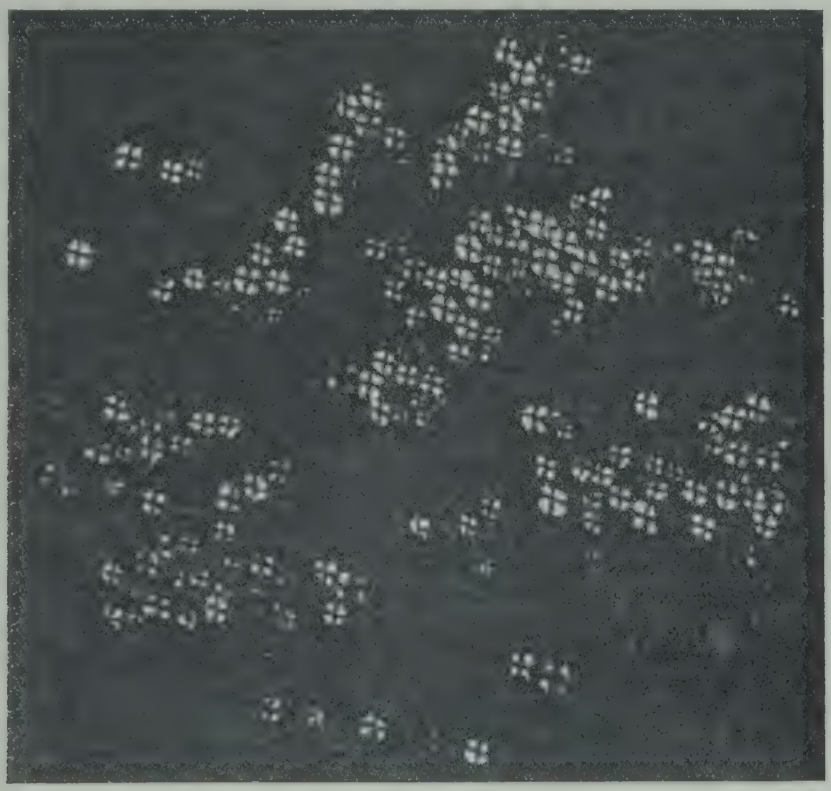
By heating at 150 to 160 degrees C., it is converted into dextrine. It is soluble in caustic soda or potash.

MANUFACTURE OF STARCH.

General Considerations.—In growing various starch-producing plants for manufacturing purposes, the following facts must be taken into account:

1. The average percentage of starch contained in the root, tuber, or grain.
2. Yield per acre.
3. Amount of starch yield per acre.

Thus, although the potato at best contains only 20 per cent of starch, wheat, on the other hand, contains 55 per cent. Nevertheless, the total amount per



Pure Corn Starch. Magnified 200 times.

acre is in favor of the potato in proportion of two to one; since one acre of land, on the average, produces 12,994 pounds of potatoes, containing 2,598 pounds of starch, as against 1,860 pounds of wheat, containing 1,023 pounds of starch.

Again, different varieties of the same species of plants will show very marked difference in the quantity of starch which they yield.

For instance, the potato as ordinarily consumed as food in this country contains only 13 per cent of starch, but in Germany, where the potato is culti-

vated for starch production by means of careful selection and suitable manuring, the percentage of starch has been raised to as much as 20 per cent. In some instances as great a yield as 24 per cent has been obtained.

The yield of starch is also affected by the age of the raw material, conditions of harvesting, and exposure to heat and cold during storage.

Diseased potatoes contain considerably less starch than sound ones, owing to its conversion into sugar by the fungus that attacks them. Exposure to extreme cold tends to diminish the amount of starch in potatoes.

Yield of starch may also be low, due to carelessness in the process of manufacture.

Raw Materials.—The raw materials almost exclusively employed in Europe and North America for the preparation of starch therefrom are wheat, potatoes, corn, and rice.

Wheat was very generally used at one time, but now has been almost entirely replaced by the other substances.

Potatoes are very largely employed on the continent, rice principally in England, and corn almost exclusively in America.

USES OF STARCH.

The uses of starch may be classed under three heads:

First. For manufacturing purposes generally, such as the sizing of paper and of cotton goods, the dressing of cloth, the thickening of mordants and colors in calico printing, the preparation of gums of white glucose syrups, etc.

Second. For laundry purposes.

Third. For edible purposes, either by itself or in the preparation of corn flours, arrowroot, tapioca, etc., or in conjunction with other substances in the preparation of sauces, macaroni, etc.

Manufacture of Starch from Maize or Corn.—This process is principally confined to the United States, and no industry in this country has grown so rapidly and concentrated itself into a small circle of factories within the last half century as the manufacture of starch from maize or Indian corn, which in this country is termed "corn starch."

The following analysis of corn, as given by Dr. Archibold, represents the average of many samples analyzed in the course of one year's working:

	Per Cent.
Water	11.2
Starch	54.8
Cellulose	16.4
Gum and Sugar	2.9
Gluten	8.2
Fat	4.7
Ash	4.8

The Manufacture of Starch from Potatoes.—At one time the manufacture of starch from potatoes was carried on to a certain extent in Great Britain as well as in Ireland, the first published specification relating to starch being

taken out as far back as 1717 by Newton, Nowell, Clark, and Jones, for a way or method to make starch from the roots called potatoes, but its development has been considerably checked by potato diseases.

In France and Germany, however, where much more attention has been directed to the growth of the potato as a starch producer, the manufacture of starch from this source has attained considerable proportions, and large quantities of potato starch are imported yearly to this country:

ANALYSIS OF POTATO.

	Average Per Cent.
Water	78.9
Ash	1.0
Protein	2.1
Fiber	0.6
N. Free Extract	17.3
Fat	0.1
Starch (Air-dried Sample)	16-23

Details in Starch Manufacture.—The details of the manufacture of starch will not be gone into in this paper.

The general procedure includes the following operations: steeping, washing, separation of stones, rasping, straining, settling, removal of the starch, purification, second straining, washing, draining, and drying in the air or in a centrifugal machine, drying in an oven, and packing.

MICROSCOPICAL APPEARANCE OF DIFFERENT KINDS OF STARCHES.

In examining different starches with the microscope, the following points should be observed.

The size and form of the granules, the position and character of the hilum, the nature of the striations or concentric rings, and the appearance presented by the granules under polarized light.

It is only by careful microscopical examination that one particular form of starch can be differentiated from another, and it is comparatively easy, when only one kind of starch is present, but when mixtures of different starches occur in the same sample the detection of each particular one becomes a matter of some difficulty.

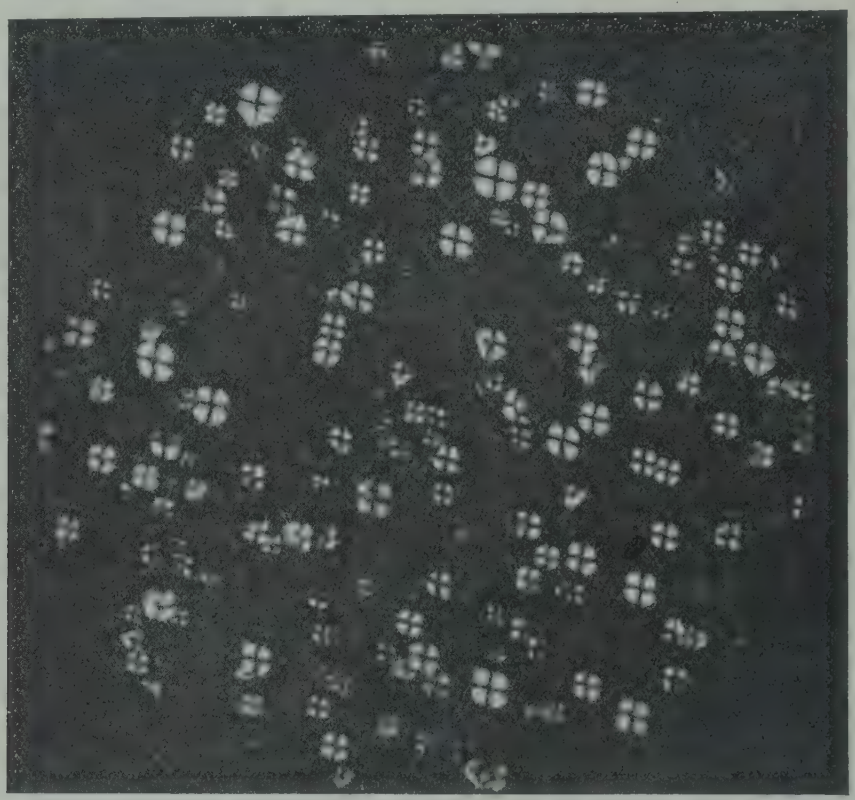
A DESCRIPTION OF WHEAT, CORN, AND POTATO STARCHES.

Wheat Starch.—The granules of wheat starch differ greatly in size, varying from 0.05 to 0.01 mm. in diameter. There seems to be, in fact, two kinds of granules in wheat starch, both of them shaped like circular discs, one class much larger than the other, but very few of an intermediate size. The hilum of the starch is almost invisible, and the rings which characterize it are not prominent.

Corn Starch.—The granules of corn starch are of a more uniform size than those of wheat, varying from 0.02 to 0.03 mm. in diameter. Now and then a few are seen which are much smaller. In general, they differ in shape from the wheat granules, and some are found to be polyhedral with rounded angles.

They resemble the granules of rice starch, but are larger. Under polarized light they appear as brilliant objects, but under the microscope with ordinary illumination they give only the faintest sign of rings, but show a well-developed hilum, which is at times starch-shaped, or like an irregular cross, and at others resembles a circular depression. The corn starch granule is a type of the angular, as the wheat is of the spherical form.

Potato Starch.—The granules of potato starch are large, oyster-shell shaped, with hilum in small end, size 0.140 mm. in diameter. Rings are very distinct and are evident without special illumination. Polarization crosses are very distinct; with the selenite plate a fine play of colors is obtained.



Pure Cassava Starch. Magnified 200 times.

POTATO STARCH IN THE TEXTILE ARTS.*

1. Potato starch possesses peculiar properties rendering it especially valuable for use in print works.

The makers of prints are willing to pay an increase in price for potato starch over that which they would have to pay for starch made from corn. This higher value has led to the adulteration of potato starch with corn starch.

Potato starch is used in the manufacture of cotton, woolen, linen, and silk goods for three (3) distinct purposes, viz.: first, as a sizing for the warp yarn before it is woven; second, for finishing the goods after they have been woven, bleached, dyed, or printed; third, in the form of dextrine or roasted starch, as a thickening or vehicle for applying the colors to the fabric.

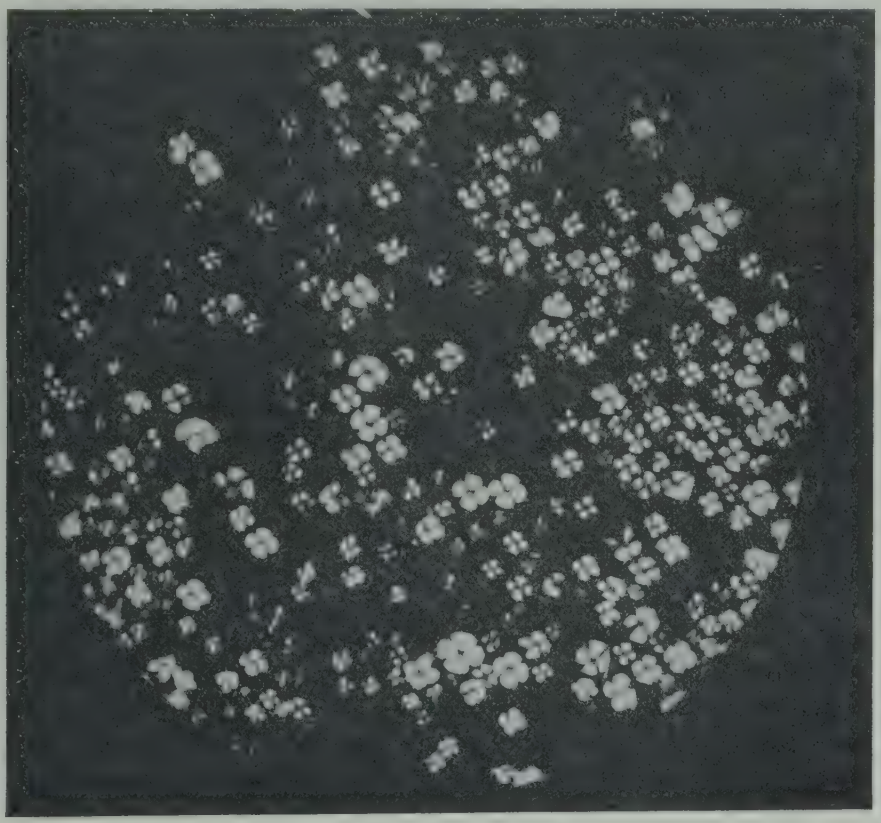
2. The preparation of starch for sizing and finishing consists mainly in mixing it with the proper amount of water. The starch mixture is boiled from

*Bulletin 8, U. S. Department of Agriculture.

ten minutes to an hour or more, as the size-maker may deem best, and after straining, to remove any lumps or gritty matter, is ready for use in the sizing or finishing machine.

Besides starch and water, various other substances are added to impart peculiar qualities to the size. Thus, to give softness to the size or finished yarns of fabric, it is customary to add some oil of fat, as tallow, cocoanut oil, bone fat, or even soaps, before or during the boiling, while various hydroscopic agents, such as glycerine and the chlorides or magnesium, zinc, or calcium, are added to prevent the size from drying too much so as to be harsh, stiff, or brittle.

The latter salts also act as antiseptic on heavily-sized yarn or goods, preventing the souring or mildewing which is liable to take place when the goods are stored in a damp place.



Sample No. 1 was represented to be Potato Starch. It proved to be mostly corn and cassava, as shown by the cut.

When it is desired to make the yarn or fabric seem heavier than it does in its normal state or to give the goods more body, make them appear thicker and more closely woven, various white pigments are added to the size, such as china clay, whiting, etc. Finally, to make the goods appear whiter, by taking away the slightly yellowish tint of the natural fiber, even after it is bleached, certain blue or bluish-violet coloring matters are added to the size or finish, chiefly ultramarine or prussian blue.

The above represents in general terms the composition of the size and finishes, though each individual sizer and finisher has his own recipes, which he

considers to be essential to his own particular requirements, and a list of the ingredients used in those recipes would cover almost every chemical known.

It is quite an art to be able to size or finish a fabric or fiber so as to imitate any sample that may be furnished, no matter whether the fabric or fiber are the same or wholly different. It is the business of the expert in charge of the sizing to make a piece of cotton feel and look like a wool or silk fabric, if he is requested to do so.

The third use of potato starch mentioned above—its use in the form of dextrine for thickening colors—is no longer a very important one, as the various corn dextrines have replaced the potato almost altogether, owing to their cheapness and greater thickening power.

For very fine, light work, especially in silk and wool printing, potato dextrine still holds its own on account of its lighter color and closer resemblance to gum arabic in its thickening properties. Its greater freedom from smell is also an advantage in certain sizing work.

Corn starch resists the action of chemicals better than potato starch and gives a better working paste.

SOURING.

Potato and corn starch do not contain enough gluten or nitrogenous matter to warrant the long and tedious operation of souring before using.

POTATO STARCH AND WARPS.

Of the several uses for potato starch mentioned above, by far the most important is for sizing of warps; very little potato starch is used for finishing cloth.

In spite of the higher price of potato starch and in spite of the fact that, weight for weight, corn starch will give a stiffer paste than potato starch, it is claimed for potato starch that it is better for sizing purposes, especially for the sizing of fine yarns. Potato starch gives a more elastic size, at the same time is thinner and more penetrating. Corn starch lies more on the surface of the fiber than the potato starch, so that a given number of threads sized with corn starch will take up more room when laid side by side than the same number sized with potato starch. Thus a yarn sized with corn starch, then woven and the size washed out, will give a more open fabric than if it had been sized with potato, provided the yarn has been woven as close together as possible. The fact that the potato size penetrates more thoroughly and is more elastic than corn size is the reason why the former dusts off less in weaving than the corn size.

POTATO STARCH PREPARATIONS.

There are one or two preparations of potato as well as of corn starch which are coming into use as ingredients of sizes and finishes, used in connection with the ordinary starch.

One of the oldest of these is the exceedingly thick, pasty preparation formed by kneading starch with strong caustic soda or potash. Sometimes the alkali is partially neutralized without losing any of its thickening properties.

Another product is formed by heating starch with a solution of zinc or magnesium chloride, with or without pressure, by which an important change is effected in the properties of the starch paste. They are sold in the paste or dry form to be used in connection with ordinary starch size.

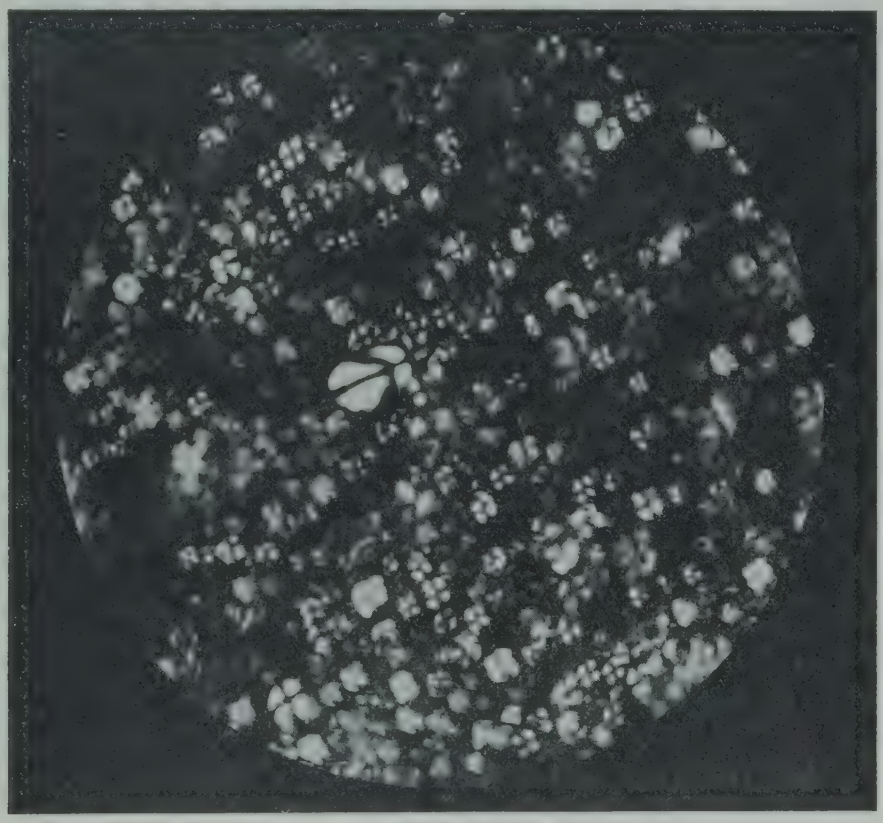
POTATO STARCH AS A SOURCE OF DEXTRINE.

In Europe large quantities of potato starch are used for the manufacture of dextrine or British gum, as it is often called.

In the process of manufacture the starch is submitted to a high temperature, preferably in contact with the diluted vapors of nitric acid.

The action of heat in connection with the slight quantity of nitric acid present is sufficient to convert the starch into dextrine, in which form it is used for various kinds of mucilage.

The manufacture of dextrine or gum of this kind is an important branch of the industries connected with starch.



Sample No. 3, represented to be Potato Starch. It proved to be mostly corn and cassava, as shown by the cut. The large starch granule seen is potato starch, but its presence is probably accidental.

SAMPLES OF POTATO STARCH FOUND ADULTERATED.

Sixty-six (66) per cent of the samples sent in represented to be potato starch were found not to be potato starch, but mixtures of different starches in which there was very little potato starch.

Sample No. 1, sent by Caraleigh Cotton Mills, Raleigh, N. C., and sold by Arnold Hoffman & Co., New York, at $3.50 per 100 pounds, for potato starch, was found to be mostly corn and cassava starch, with perhaps some potato starch.

Sample No. 3, sent in by The Worth Manufacturing Company, Worthville, N. C., and sold by a New York starch concern, at $3.65 per 100 pounds, for potato starch, was found to be mostly corn starch and cassava, with perhaps some potato starch.

Sample No. 37, sent in by Chatham Manufacturing Company, Elkin, N. C., and sold by Arnold Hoffman & Co., for $3.58 per 100 pounds, for potato starch, was found to be mostly corn starch, with perhaps some potato starch.

Sample No. 51, sent in by Ivey Mill Company, Hickory, N. C., and sold by Arnold Hoffman & Co., for $4.50 per 100 pounds, for potato starch, was found to be a mixture of corn and potato starch, mostly corn starch.

Sample No. 39 was represented to be Potato Starch. The cut shows it to be a mixture of corn and potato starches. The large granules are potato starch, the small ones corn starch.

Sample No. 9, sent in by Great Falls Manufacturing Company, Rockingham, N. C., and sold by Arnold Hoffman & Co., New York, for $3.75 per 100 pounds, for potato starch, was found to be mostly corn starch, with perhaps some potato starch.

Sample No. 21, sent in by Leaksville Cotton Mills, Leaksville, N. C., and sold by Arnold Hoffman & Co., New York, for $3.65 per 100 pounds, for potato starch, was found to be mostly cassava starch. No evidence of potato starch.

WHEAT STARCH FOUND ADULTERATED.

One sample of wheat starch, No. 13, sent in by Gibson Manufacturing Company, Concord, N. C., and sold by Arnold Hoffman & Co., for $4.20 per 100 pounds, for wheat starch, was found to be a mixture of corn and wheat starch.

SAMPLES OF POTATO STARCH NOT ADULTERATED.

Sample No. 26, sent in by Hoskins Mill, Charlotte, and sold by Eustis, Pennock & Co., Boston, at $3.70 per 100 pounds, for potato starch, was found to be potato starch.

Sample No. 4, sent in by Worth Manufacturing Company, Worthville, N. C., and sold for $3.81 per 100 pounds (manufacturers not given), for potato starch, was found to be potato starch.

Sample No. 38, potato starch, sent in by Erwin Cotton Mills, West Durham, N. C. (manufacturers and price not given), was found to be potato starch.

SUMMARY.

RESULTS OF THE CHEMICAL EXAMINATION OF COMMERCIAL POTATO, CORN, CASSAVA, AND KEEVER STARCHES.

From the analyses just completed in this laboratory the average per cent of protein and ash in the starches examined is as follows:

	Protein, Per Cent.	*Ash, Per Cent.*
Corn Starch	0.44	0.16
Potato Starch	.26	.35
Cassava Starch	.23	.34

It will be seen from the above that there is very little difference in the composition of cassava and potato starches.

The more protein a starch contains the more gluten it contains. Therefore, the higher the per cent of protein in starch the higher the per cent of gluten.

It will be seen from the chemical composition of corn and potato starches that corn starch contains nearly twice as much protein as potato starch.

This indicates that the gluten content of corn starch greatly exceeds that of potato starch.

Corn starch, having a higher per cent of gluten than potato starch, makes a thicker and more viscous paste. Potato and cassava starches make a thinner paste which penetrates the cloth or fiber to a much greater extent.

The corn starches examined showed very little difference in chemical composition.

N. STARCH.

This starch is a corn product. It differs from other corn starches in that it has had some chemical added to it which renders it alkaline.

It has a higher per cent of ash, but not sufficiently high to indicate that any mineral substance had been added for the purpose of increasing its weight.

KEEVER STARCH.

This starch is made by the Keever Starch Company, of Columbus, Ohio, and is sold under the trade name of Victor Mill Starch.

It is a mixture of corn, wheat, and rice starches, the corn starch composing quite the largest part. Its protein and gluten content is higher than that of corn starch.

This is due, perhaps, to the high protein content of the wheat starch present.

HAWKEYE BRAND.

The Hawkeye Brand of corn starch, manufactured by the National Starch Company, was found to be corn starch to which some chemical had been added which rendered it alkaline.

NEUTRAL STARCHES.

All natural starches are neither acid nor alkaline, but neutral.

All starches examined were neutral except the two above mentioned, which were alkaline.

MINERAL MATTER.

No mineral matter added for the purpose of increasing the weight was found in any of the starches examined.

PROPRIETARY OR TRADE-NAME STARCHES.

Starch should never be bought because it has some proprietary or trade name. There is nothing in a name. In purchasing starch, the buyer, in order to protect himself from fraud, should insist upon a guarantee of its composition. That is, he should require the manufacturer or dealer to state the kind of starch or, if a mixture, the percentage of the different kinds present.

RESULTS OF SAMPLES OF STARCHES EXAMINED.

The following table shows the results of starches examined:

RESULTS OF

Laboratory Number.	Name.	Sent in by	Manufactured by
1	Potato Starch	Caraleigh Cotton Mills, Raleigh, N. C.	Arnold Hoffman & Co., Providence, R. I.
2	Tapioca Starch	----do	----do
3	Potato Starch (a)	Worth Mfg. Co., Worthville, N. C.	New York Starch Concern
4	Potato Starch (b)	----do	Not given
5	Corn Starch (second sample).	----do	----do
6	Hoosier Pearl Corn Starch.	Pilot Cotton Mills, Raleigh, N. C.	Piel Bros. Starch Co., Indianapolis, Ind.
7	Warner's Eagle Pearl Corn Starch.	-----do	Corn Products Refining Co., Waukegan, Ill.
8	Pearl Starch	Aurora Cotton Mills, L. J. Holt & Sons.	Douglas & Co., Cedar Rapids, Iowa.
9	Holland Potato Starch	Great Falls Mfg. Co., Rockingham, N. C.	Arnold Hoffman & Co., Providence, R. I.
11	Hawkeye Pearl Corn Starch.	Proximity Mfg. Co., Greensboro, N. C.	Corn Products Refining Co., Pekin, Ill.
12	Hawkeye Brand Corn Starch.	Gibson Mfg. Co., Concord, N. C.	National Starch Co., New York
13	Wheat Starch	----do	Arnold Hoffman & Co., Providence, R. I.
14	N. Starch	Delgado Mills, Wilmington, N. C.	National Starch Co., New York
15	----do	----do	----do
16	Pearl Starch	Asheville Cotton Mills, Asheville, N. C.	Piel Bros. Starch Co., Indianapolis, Ind.
18	Corn Starch	Eugenia Mfg. Co., Jonesboro, N. C.	T. S. Southgate & Co., Norfolk, Va.
19	N. Starch	Leaksville Cotton Mills, Leaksville, N. C.	National Starch Co., New York
20	Victor Mill Starch	----do	Keever Starch Co., Columbus, O.
21	Holland Starch	----do	Arnold Hoffman & Co., Providence, R. I.
22	Corn Starch	Naomi Falls Mfg. Co., Randleman, N. C.	Corn Products Refining Co., New York.
23	Java Starch	----do	Arnold Hoffman & Co., Providence, R. I.
25	Corn Starch	Chadwick Mill, Charlotte, N. C.	National Starch Co., New York
26	Potato Starch	Hoskins Mill, Charlotte, N. C.	Eustis, Pennock & Co., Boston, Mass.
27	N. Starch	Cliffside Mills, Cliffside, N. C.	National Starch Co.
28	Corn Starch	Holt Granite Mfg. Co., Haw River, N. C.	----do
29	Eagle Starch	Nokomis Cotton Mills, Lexington, N. C.	----do
30	Victor Starch	----do	Keever Mfg. Co., Columbus, O.
31	Java Starch	Randleman Mfg. Co., Randleman, N. C.	Arnold Hoffman & Co.
32	Pearl Corn Starch	----do	Corn Products Refining Co., New York.
33	N. Starch	The High Shoals Co., High Shoals, N. C.	National Starch Co., Indianapolis, Ind.
34	Pearl Grade Starch	Nantucket Mills, Spray, N. C.	National Starch Co., New York
35	----do	Lily Mills, Spray, N. C.	----do
36	Keever Starch	Odell Mfg. Co., Concord, N. C.	Keever Starch Co., Columbus, O.
37	Potato Starch	Chatham Mfg. Co., Elkin, N. C.	Arnold Hoffman & Co., New York
38	----do	Erwin Cotton Mills, Durham, N. C.	-----
39	----do	Ivey Mill Co., Hickory, N. C.	Arnold Hoffman & Co., New York

STARCHES EXAMINED.

Laboratory Number.	Price Per 100 Pounds.	Per Cent Protein.	Per Cent Ash.	Per Cent Moisture.	Acid, Neutral or Alkaline.	Viscosity.	The Microscopical Examination Shows This Product to be
1	$ 3.50	0.42	0.27	10.50	Neutral ---	13	Mainly Corn and Cassava Starch, with perhaps some Potato Starch.
2	3.50	0.25	0.41	8.36	----do -----	23	Cassava, Java or Tapioca Starch.
3	3.65	0.34	0.27	9.05	----do -----	15	Corn and Cassava Starch, with perhaps some Potato Starch.
4	3.81	0.22	0.40	12.91	----do -----	22	Potato Starch.
5	2.50	0.52	0.23	7.83	----do -----	11	Corn Starch.
6	2.40	0.47	0.30	5.95	----do -----	11	do.
7	2.40	0.45	0.24	6.58	----do -----	11	do.
8	2.40	0.42	0.14	10.06	----do -----	11	do.
9	3.75	0.37	0.30	7.54	----do -----	15	Corn Starch, with perhaps some Potato Starch.
11	2.41	0.45	0.07	6.64	----do -----	11	Corn Starch.
12	2.44	0.25	0.71	7.80	Alkaline---	12	do.
13	4.20	0.42	0.20	8.11	Neutral ---	14	A mixture of Wheat and Corn Starch.
14	2.42	0.40	0.83	10.30	Alkaline---	12	Corn Starch.
15	2.42	0.37	0.85	8.34	----do -----	12	do.
16	2.50	0.50	0.23	7.66	Neutral ---	12	do.
18	2.30	0.50	0.23	9.19	----do -----	11	do.
19	2.50	0.42	0.81	11.25	Alkaline---	12	do.
20	3.56	0.57	0.26	9.71	Neutral ---	11	Corn Starch, with some Wheat and Rice Starch.
21	3.65	--------	0.31	12.02	----do -----	18	Corn and Cassava Starch—no evidence of any Potato Starch.
22	2.44	0.50	0.08	7.75	----do -----	11	Corn Starch.
23	3.75	0.25	0.31	12.29	----do -----	23	Cassava, Java or Tapioca Starch.
25	2.40	0.47	0.22	6.44	----do -----	11	Corn Starch.
26	3.70	0.26	0.30	13.47	----do -----	22	Potato Starch.
27	2.51	0.37	0.90	8.77	Alkaline---	12	Corn Starch.
28	--------	0.60	0.10	9.20	Neutral ---	11	do.
29	--------	0.50	0.14	9.20	----do -----	11	do.
30	--------	0.55	0.12	7.71	----do -----	11	Corn Starch, with some Wheat and Rice Starch.
31	3.75	0.20	0.32	9.00	----do -----	23	Cassava, Java or Tapioca Starch.
32	2.44	0.50	0.10	6.85	----do -----	11	Corn Starch.
33	2.66	0.37	0.70	6.86	Alkaline---	12	do.
34	--------	0.42	0.12	7.27	Neutral ---	11	do.
35	--------	0.45	0.11	6.26	----do -----	11	do.
36	--------	0.60	0.35	7.88	----do -----	11	Corn Starch, with some Wheat and Rice Starch.
37	3.58	--------	--------	--------	----do -----	------	Corn Starch, with some Potato Starch.
38	--------	--------	--------	--------	----------	------	Potato Starch.
39	--------	--------	--------	--------	----------	------	A mixture of Corn and Potato Starch.

The following samples of starches were received too late for a chemical examination, but were examined microscopically:

Two samples from Pee Dee Manufacturing Company, Rockingham. Both were found as represented to be—corn starch.

One sample from McAden Mills was found as represented to be—corn starch.

One sample from Charlotte Cotton Mills was found as represented to be—corn starch.

One sample (N.) starch from Charlotte Cotton Mills was found as represented to be—corn starch.

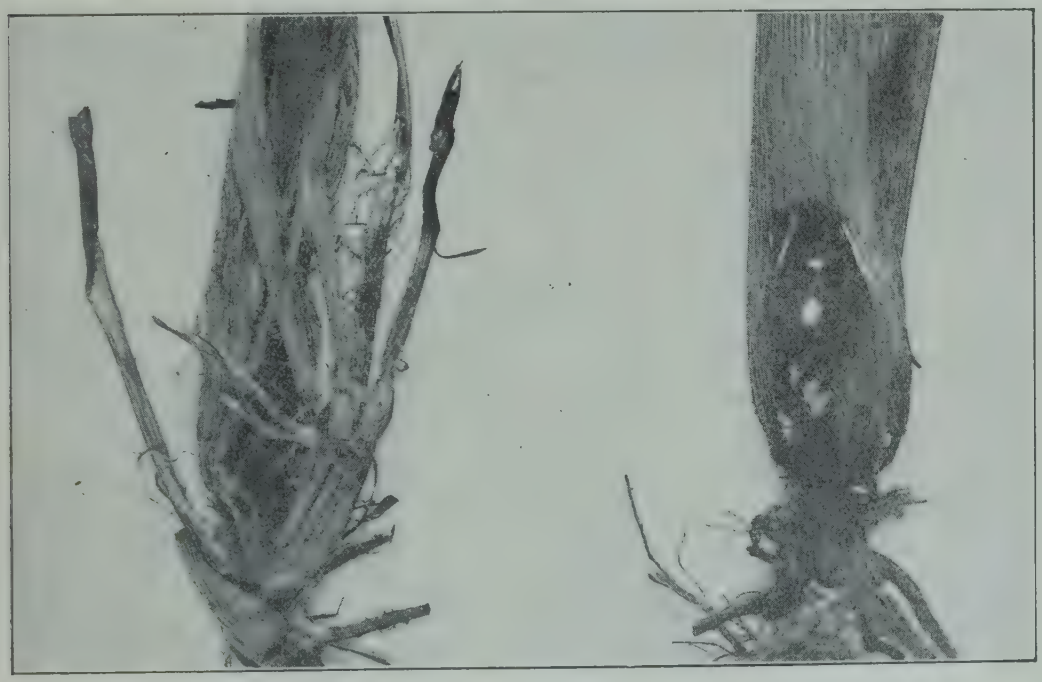
INSECT ENEMIES OF CORN.

By Franklin Sherman, Jr., Entomologist.

GENERAL CONSIDERATIONS.

At the outset it must be remembered that corn is a crop of low commercial value. The value of its product per acre is so low that expensive measures are not justifiable, except where such treatment is to prevent the insects from spreading over larger areas in the field. It is not practicable to spray a cornfield to kill insects, yet it is practicable and often advisable to spray a few rows along the edge of a field when the chinch bug, or army worm, is just getting started. The low value of the crop renders it difficult or even impossible to combat some of the pests satisfactorily.

Corn is grown in such large areas and there are so many individual plants in a field, that it is usually unprofitable to adopt any method which calls for the treatment of individual plants, except, as stated before, in cases where such treatment will prevent the insects from spreading more widely through the field.



Sugar-Cane Beetle.
Beetle at work in corn stalk at right. Injured stalk at left. Natural size.
(Photograph by H. H. Hume.)

These considerations show us plainly that in combating many of the insect pests of corn we must rely on such methods of culture and handling of the crop as shall render it least liable to insect injury. With any crop of low commercial value, such as corn, cotton, wheat and the like, *prevention* is the watchword in dealing with insect pests.

CULTURAL CONSIDERATIONS.

By changing or modifying the methods of culture, much may be done to avoid injury. This matter is so important that we will consider it more in detail.

Rotation.—Any system by which corn follows grass or a growth of weeds is injurious, from the standpoint of insect pests. Where land just from sod is put in corn, the crop suffers more from wireworms, white grubs, root webworms and cutworms than it does when it follows a cultivated crop like cotton. Suppose we have a field now in sod which we wish to bring into cultivation: A system of rotation which will give the minimum amount of insect injury to the corn might be arranged as follows: First year, plant the field in a small grain, and after that in peas. Second year, cotton, potatoes, cabbage or other cultivated crops. Third year, corn (peas may also be grown with the corn). Fourth year, small grain and peas again, and so on. A shorter system may be used, but it is *best* to have corn at least two years removed from a growth of grass or weeds, and it is *advisable* to have it separated from small grain by one year in a cultivated crop. Of course, such a plan may not always be feasible, but it is best so far as avoiding insect injury is concerned, and the nearer we can come to it the better. The employment of peas in the rotation is beneficial from all points of view. Not only do they tend to improve the land, but they do not in any way render the corn more subject to insect injury.

Corn following corn year after year is also favorable to the increase of certain insects, and should be avoided.

Fertilization.—We wish under this head to call attention to the fact that a crop of corn which has been put into healthy condition by fertilization, whether by commercial or farm manures, is better able to withstand and recover from insect attacks than one which has not been so aided. Here the peas serve a useful purpose. It has also been claimed that where heavy applications of kainit or other salty fertilizers are used, the wireworms, cutworms and other underground insects are checked to a considerable extent. Whether or not this is true has not been fully demonstrated.

Disposition of Remnants.—Throughout the Southern States it is a common custom to "pull" the fodder, leaving the stalks standing in the field with the shucks attached until the land is needed for other purposes, when they are beaten down and plowed under. Such a practice is detrimental from the standpoint of one who wishes to avoid insect injury. If the fodder were cut at the ground (or as close to it as practicable) and the stalks and leaves shredded or made into ensilage, a reduction of insect injury would result, and the value of the fodder and grain would both be increased by the process. Many insects find hibernating places in these stalks and husks. Chinch bugs, grain weevils and stalk borers are all favored by this custom of "pulling" and leaving the stalks, and all will be more or less reduced by abandoning the custom and making use of the shredder and the silo. Even the plowing out, raking together and burning of the stubs will sometimes be advisable.

The Ideal System.—Having gone into some detail with these cultural considerations, it is well now to summarize with a statement of the method to be followed where one hopes to incur the minimum amount of insect damage.

The field should be on land well drained and of sufficient elevation not to be subject to overflow. It should be at least two years out of sod, and the year previous to corn should have been in some hoed or cultivated crop. If there is much growth of weeds or grass on the land it should be plowed in the fall.

The land should be deeply plowed, well fertilized, and the corn should be given frequent and thorough cultivation. At harvest the stalk should be cut at the ground and shredded or made into ensilage.

The writer understands perfectly that such a system as this cannot always be carried out in all details, but he does claim that such a system will involve a minimum amount of insect injury; and the system has much to recommend it on other grounds. It would result in a greatly increased yield and value of the crop aside from any consideration of insects.

INSECT ENEMIES OF CORN.

Wireworms (Several Species). Order *Coleoptera*. Family *Elateridæ*.

(Also sometimes called "Drillworm.")

Description.—Slender, smooth, firm-bodied, yellowish-brown larvæ, attaining length of from one to two inches, which destroy the corn by eating the seed before it comes up, or by eating into the stalk of the plant just below the surface of the ground, causing the center of the growing part of the plant to die.

Injury in North Carolina.—Any insect which does its work underground is not likely to attract attention except in cases of very serious injury, consequently the few reports which we have had cannot show adequately the damage that these pests inflict. It seems quite certain, also, that some farmers confuse Wireworm injury with Budworm injury, so that what is sometimes attributed to one may in reality be due to the other.

Fig. 1.—Adult and larva of Wireworm. It is the larva or worm form that does the damage. The adult beetle is known as a "Jack-snapper" and does no harm other than to lay the eggs.
(After Comstock and Slingerland.)

Life-history.—Wireworms are the young, or larvæ, of the beetles which are called "Jack-snappers," "Snap-jacks," "Click beetles," "Hominy-beaters," "Elaters," "Thumping-beetles," and other similar names. The beetles have these names because of their power to spring suddenly into the air when placed on the back. There are something like five hundred species of beetles belonging to the family (Elateridæ) in the whole of North America, while our records show that fifty-nine species have already been recorded in North Carolina; and no doubt many more will be found later. The adult beetles are seldom, if ever, seriously injurious; but their larvæ are frequently so. The larvæ of many of the species live in rotten wood or under bark of dead trees, and others feed upon the seeds or tender roots of plants under the surface of the ground. The larvæ are so much alike that they cannot be identified, hence a species can only be named with certainty when it is in the adult (beetle) stage.

So far as we have been able to observe, the great bulk of Wireworm injury to corn in this State is by only a few species—probably not more than three or

four. The following account will give a good general idea of the history of those species that attack corn, the details probably varying somewhat in the different species:

Many of the adult beetles pass the winter in dead wood, under bark, under trash, boards, leaves, at the base of tufts of grass, etc. In the summer they lay eggs, usually depositing them in grassy places. The larvæ hatching from the eggs are slender, smooth, yellowish-brown in color and firm in texture, and are called "Wireworms." They burrow through the soil, feeding on various seeds and roots which they may find. It is thought that it takes most species from two to three years to reach maturity. Then they change to the stage known as the *pupa* in a cell in the soil. While in the pupa state they are quiet and take no food, but are going through the change from larvæ to adult beetles. After a few weeks in the pupa state the insect changes to an adult beetle, this change usually taking place (it is thought) in late summer. The adult beetle does not emerge, however, until the next spring. Whether a beetle which thus passes the winter in a cell underground will live all through the next summer and pass the next winter in such places as before mentioned we do not know. As a general rule, insects do not pass more than one winter in the adult condition.

Summary.—It will be noticed from the foregoing accounts (1) that Wireworms are more destructive on lowlands, and (2) that they are much worse on land just from sod. We have also seen that they feed primarily on the seeds and roots which they find in the soil. They do not attack corn (nor other cultivated crops) because they like it, but simply because their normal food is lacking. When sod land is broken they are already in the soil, consequently must attack whatever grows and offers them food. It takes from two to three years for the larvæ to mature, and the adults deposit the eggs mainly in sod lands. Having these facts firmly in mind, we can more easily appreciate the recommendations which follow.

REMEDIES.

The first consideration in attempting to avoid injury to corn by Wireworms is not to allow corn to follow directly after sod. If corn must follow sod, plow the land in the fall and stir once or twice during the winter. These measures will starve and kill by exposure many of the larvæ and will break open the little cells in which the newly-formed adults are passing the winter and kill the insects. By avoiding lowlands (especially low *sod* lands) much injury will be averted. Good fertilization and frequent tillage will also check the insects or enable the corn better to recover from their attacks.

In regard to corn after sod, it should be remembered that most species of Wireworms are thought to take two or three years to become full grown, hence it is well to have the land in some other crop not so subject to injury during the first year from sod, so that the majority of the insects will have had time to mature and deposit their eggs elsewhere.

These various measures are further discussed under the heads of Rotation (p. 491) and Fertilization (p. 492).

CUTWORMS (Several Species). Order *Lepidoptera.* Family *Noctuidæ.*

Description. Rather stout-bodied, soft, brown, blackish or grayish caterpillars, which remain concealed during the day and do great injury at night by eating off various kinds of young succulent plants at or near the surface of the ground.

Injury in North Carolina.—Everybody knows what Cutworms are. So well-known and so universally common and destructive are they that their injuries in ordinary seasons excite no particular interest or comment. Everybody takes it as a matter of course to lose a part of his cabbage, tomatoes, tobacco, corn or any other green succulent crop, from their ravages. Consequently the correspondence files of this office show but little reference to injury from this source. Like the Potato Beetle and House Fly, people take them so much as a matter of course that they give them no serious attention. Judging from our office notes, one might almost wonder whether there were any Cutworms in North Carolina.

April 22, 1901, Mr. R. W. Caviness, Southern Pines, Moore County, sent the following letter, accompanied by specimens of Cutworms:

This place seems to be full of the fellows in this box. There was a scourge of them here last year, and I was unable to get a stand of watermelons until the worms matured. It would be foolishness to plant a field of cantaloupes here. The worms eat every green thing. These were found around the dewberry vines, sometimes as many as ten or twelve at one vine. They crawl up the vines and eat the buds and leaves. They also crawl up and eat the leaves from young peach trees. Impossible to get a stand of beans, cabbage, or any other garden stuff. They cut fall-sown turnips until it got too cold for them.

Mr. Caviness was not the man to make such statements as these unless they were warranted by the facts. The writer considers him the most careful observer of injurious insects that he has ever known in North Carolina, and the cause of Economic Entomology in this State suffered a great loss in his death.

The present season (1905), since we have been soliciting notes regarding insects from a corps of county correspondents in various parts of the State, we have received several brief notices of damages.

April 23d, Mr. J. K. Bryan, Warsaw, Duplin County, says: "There seem to be more Cutworms than usual around here."

April 28th, Mr. D. W. Garmon, R. F. D. No. 7, Concord, Cabarrus County, says: "I send Cutworms which attack cabbage, tomatoes; in fact, everything."

May 2d, Mr. Benjamin B. Rhyne, R. F. D. No. 2, Gastonia, Gaston County, wrote: "Cutworms already working on corn. Seems to be general, and, I believe, will be abundant. More destructive to cabbage than usual."

May 23d, Mr. E. M. Lindley, R. F. D. No. 1, Sylvester, Chatham County, says: "I send you a few Cutworms found in the cornfield. Some had cut the corn down and pulled it in the ground."

Others of like import might be quoted.

Life-history and Habits.—As with the Wireworms, so with Cutworms: there are a number of different species concerned. They are all the caterpillar stage, or larvæ, of moths, and the family *Noctuidæ* to which they belong contains upward of two thousand species. The larvæ of all of these would not be considered as true Cutworms, however, and of those which could be truly classed under that name there are probably not more than thirty or forty

species that are ever serious pests in the eastern United States. From our scattered observations we believe that ninety-five per cent of all the Cutworm injury in this State is caused by not more than six or eight species.

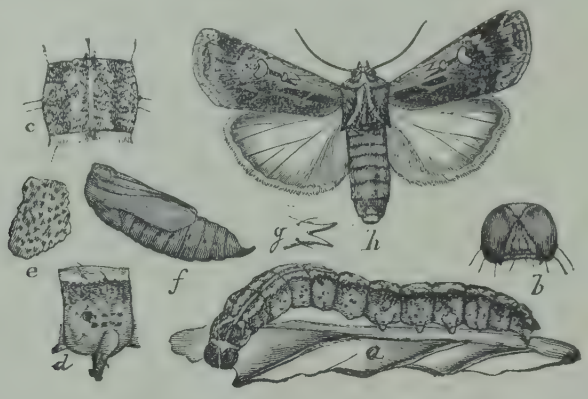


FIG. 2.—The Granulated Cutworm (*Feltia annexa*), showing larva (*a*), pupa (*f*), adult moth (*h*), and details of structure.
(After Riley and Howard, Div. of Ent., U. S. Dept. Agr.)

Some work yet remains to be done in rearing our Southern Cutworms to the adult state before it will be possible to give in detail the life-history of all of our common species. Some species mature and emerge as moths in early summer, while others emerge as moths in the fall. Thus far we have observed no species which is seen in the adult state both in summer and fall; so that it seems that they are all single-brooded, some of the species emerging as moths in early summer and other species emerging in the fall.

Mr. C. S. Brimley, of Raleigh, who has long taken an interest in collecting, rearing and studying insects, reared to maturity a number of Cutworms during 1903-'04. Some of these have been identified, while others have not. The notes here given refer to the dates on which the adult moths emerged in Mr. Brimley's cages, or when adult moths were captured:

The Granulated Cutworm.—*Feltia annexa, Treit*, August 29, September 20, October 7, 12, 1903.
Feltia hirilis, Grote, September 17, 25, 1904.
The Dingy Cutworm.—*Feltia subgothica, Hawworth*, September 12, 27, 1904.
Prodenia commelinæ, Sm. and Abb., August 17, 1904.
Peridroma saucia, Hub., June 22, 23, 24, 1903.

Other species, not yet identified, emerged as follows: Species No. 1 (spring species), June 4, 28, 1903. One captured (not bred) May 30, 1902. Species No. 2 (fall species), October 7 (two specimens), 12, 1903.

From these notes it seems that for the spring species June, and for the fall species September and October, are the principal months of activity and egg-laying by the adult moths.

Of course, the details in the life-history of a species will vary somewhat according as it matures in the spring or in the fall; but the following will serve as a condensed account:

The larvæ (the destructive cutworm stage) pass the winter in the earth, or on the surface under such shelter as they can find, in a partly grown condition. The long fast of winter gives them ravenous appetites when the warm days of spring arouse them to activity, and they feed on any green succulent young plants that they can find. Some species have the habit of climbing trees or other plants to eat the tender expanding leaves, but those that are

most destructive to corn do their damage by eating off the young stalks at or near the surface of the ground. Sometimes the severed stalk (if it be young and small) is dragged partially into the ground. The worms usually remain quiet during the day and feed mainly at night. Sometimes, however, they will work during the day if the weather be cloudy. Cool weather seems to sharpen their appetites. When the larvæ become grown (which varies according as the moth is to emerge in spring or fall), they change to *pupæ* in the earth, an inch or so under the surface, sometimes only barely covered by the soil. Those that are to emerge in spring change to pupæ about the middle or latter part of May; and it is because these larvæ *become mature* at this season that they cease their injuries, and not usually because of any epidemic of disease among them. In the pupa state they, of course, are without legs or wings, and take no food—it is simply a stage of transition from the larvæ to the adult moth. After a few weeks in the pupa stage the adult moth bursts from the pupa shell. Most of the Cutworm moths are dull gray or brown in general color, marked

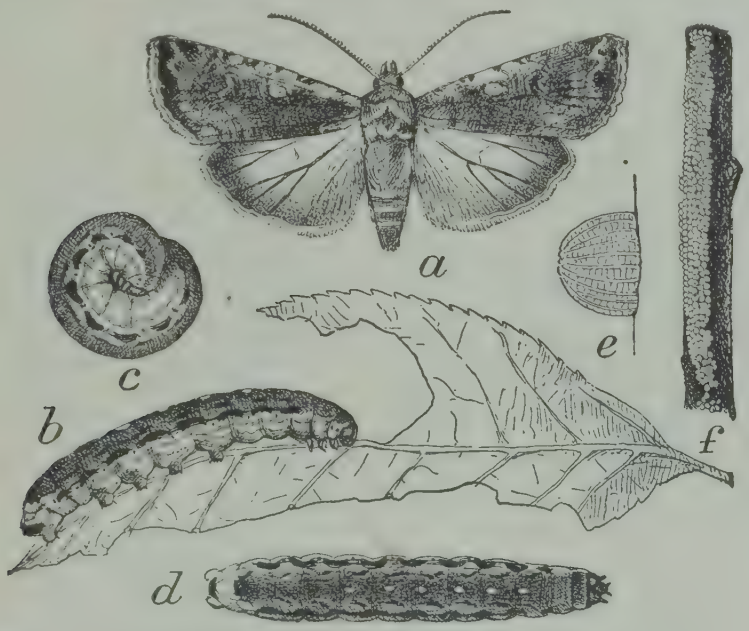


FIG. 3.—Another Cutworm (*Peridromia saucia*), showing adult moth (*a*), larva (three views) (*b*, *c* and *d*), egg (enlarged) (*e*), and eggs in natural position on grass stalk (*f*).

(After Howard, U. S. Dept. Agr., Div. Entomology.)

with lighter streaks or spots, and with the hind wings lighter in color, sometimes of a pinkish hue. When the wings are expanded they measure from one to two inches from tip to tip. These moths fly mostly at night and are often attracted to bright lights and not infrequently enter houses and flutter about the lamps or walls. The females deposit their eggs on trash, grass or weeds, in sod or weedy lands, and the larvæ become partly grown by winter and hibernate as already explained.

Summary.—Cutworms are the larvæ of night-flying moths. They pass the winter as larvæ, eat voraciously in the spring, become mature, pupate, and emerge as moths in early summer or fall, according to the species. June, September and October seem to be the principal months for egg-laying. Eggs are deposited in weedy or sod fields, after which the moths die. The larvæ pass the winter in a partly grown condition in the fields. With these points clearly understood it will be easy to comprehend the following remedial suggestions:

REMEDIES.

As the eggs are laid in weedy and sod lands, corn planted on land just from sod or weeds will suffer most. Therefore the first consideration is to have corn follow some cultivated crop. If the corn must come after a growth of grass or weeds, then by plowing the land in the fall many of the Cutworms will be killed by exposure or starvation before the corn is planted in spring. If the land be plowed before the fall moths have deposited their eggs (before the 20th of September, let us suppose), then the moths will deposit the eggs in other fields, and the field to be put in corn will be correspondingly free from them. By delaying the planting until late in the spring, the spring species will be nearly or entirely grown, and will therefore not do serious injury. The very late planting may not always be advisable, however, on account of drought or other conditions, but it is one of the possible means of avoiding Cutworms. Frequent cultivation as soon as the corn is up will also disturb the larvæ in the soil and deter them in some degree.

But if we must put a piece of spring-plowed sod or weedy land into corn, and wish to plant at the normal season, there is still a method (not always easy or entirely satisfactory, perhaps) by which we may combat the Cutworms. When the land is plowed in the spring, much of their food is destroyed, and they become hungry. It is then, after breaking and harrowing the land and before the corn is planted, that it is possible to poison them. Clover or other green and succulent vegetation may be poisoned with Paris green and distributed through the fields as a bait to the worms. The clover may be sprayed as it stands and then cut; or perhaps the better and more thorough plan would be to cut it and dip it into a barrel of the poisoned solution. The Paris green for this purpose should be thoroughly mixed with water at the rate of about one pound to the barrel (40 to 50 gallons) of water. Arsenate of lead may be used instead of Paris green, at the rate of five or six pounds to the barrel. Paris green and wheat bran have been used in gardens, at the rate of about one ounce of the poison to two or three pounds of the bran. A mash made of bran, Paris green and water, and sweetened with molasses, has also been used by gardeners. But in field operations, with corn grown on a large scale, the main practices to be relied upon are (1) the avoidance of corn after sod or weeds, and (2) fall plowing (as early as convenient), if such land must be put into corn in the spring. The poisoning methods will often be too expensive and too uncertain for use on a large scale in cornfields.

For further discussion of the methods mentioned the reader is referred to what is said under the head of Rotation (p. 491) and The Ideal System (p. 492).

THE BUDWORM. *Diabrotica 12-punctata*, Oliv.

Order *Coleoptera*. Family *Chrysomelidæ*.

(Also known as the Corn-root Worm and Drillworm.)

Description.—A slender grub or larva, about half an inch long, yellowish-white in color, with brown head, body slightly larger at tail-end than at the head; destroys young corn by eating into the stalk at or just above the roots. Worse on lowgrounds.

Injury in North Carolina.—Here again we find an insect about which there seems to be some confusion. There is some confusion between this species and the Wireworms. Many reports of this pest have reached this office, by conversation, by correspondence, and through the papers; but it has almost never been our good fortune to receive living specimens in good condition for study, nor has a suitable opportunity yet offered for the writer to make a satisfactory examination of an outbreak in the cornfield.

Two farmers, Dr. E. Porter, Rocky Point, Pender County, and Mr. James Middleton, R. F. D. No. 1, Garner, Wake County, with most commendable curiosity to learn about this pest, went so far as to place fruit-jars or other receptacles over corn which had been attacked and thus were able to examine the adult insect that matured from these Budworms. Both the gentlemen have identified the insect figured herewith (enlarged) as the species which they reared. It is evident from their testimony and the letters quoted that while there may be some confusion between this and the Wireworm, yet the great majority of complaints of "Budworms" refer to the species here discussed.

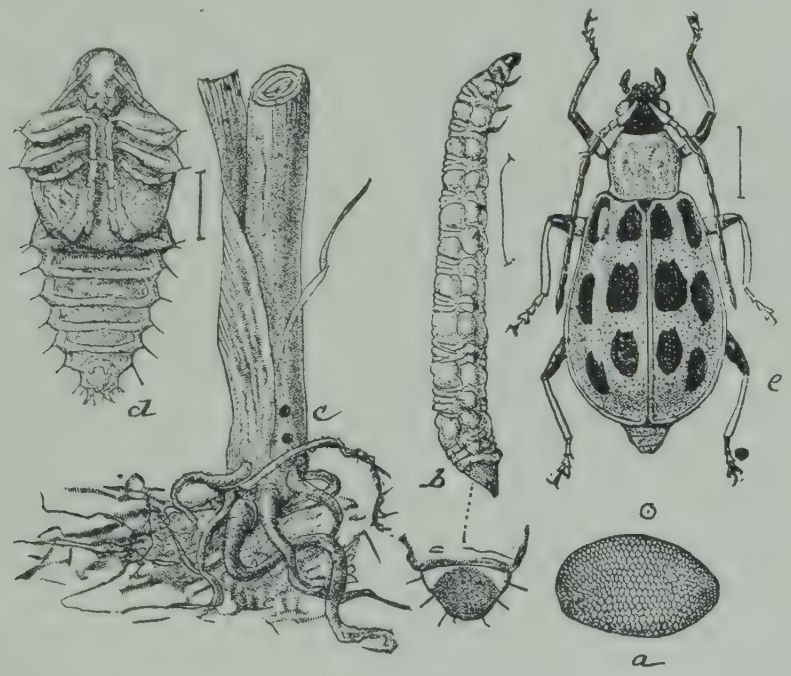


FIG. 4—The Corn Bud-worm, showing adult beetle (*e*), larva (*b*), pupa (*d*), and egg (*a*), all enlarged; natural sizes indicated by lines, etc., at side. Work on corn shown natural size at *c*.

(Redrawn from Riley, Div. Ent., U. S. Dept. Agr.).

Life-history and Habits.—The adult beetle of the "Budworm" is the "Spotted Melon Beetle," and is often a pest on squash, melon, cucumber and pumpkin by eating the leaves. It is also very closely related to the smaller and more destructive Striped Melon Beetle. The family of beetles (Chrysomelidæ) to which it belongs is a large one, containing some six hundred species, and including many of our most destructive pests, such as the Potato Beetle, Flea-beetle, Elm Leaf-beetle and others. In most of the species the adult beetles feed on the leaves of plants, and in most the larvæ also feed on leaves, but some, as in the case of this species, bore within the soft tissue of living plants.

The adult beetles pass the winter under rubbish, stones, boards, leaves, etc. They are among the first insects to become active and begin to fly in the spring. They are about one-third of an inch long, greenish-yellow in color, with black spots as shown (enlarged) in the illustration. The adults, on emerging, at once begin to feed upon almost any kind of early growing, green vegetation. They sometimes do serious injury by eating the leaf and blossom buds on fruit trees, and we have observed them abundant on the plum. Roses, wheat, cabbage, beans and melons (and related plants) are attacked with avidity, especially the last named. So far as we have learned, the eggs have never yet been positively recognized in the field; but females in cages in the Bureau of Entomology, U. S. Department of Agriculture at Washington, deposited eggs on the earth, in little crevices, close by the base of corn plants. The larvæ soon after being hatched burrow directly to the center of the young stalk, grow rapidly and become mature in three or four weeks, when they leave the corn and change to the pupa state in little cells in the earth. These in turn develop to adult beetles within about two weeks. The adults emerge, lead an active and destructive life, lay eggs for another generation, and die. This next generation comes to maturity in the fall and passes the winter; so there are at least two broods. Just where the eggs are laid that produce the second brood does not seem to be positively known, as very little corn is sown late enough to serve as food for this second generation of larvæ. Perhaps some of our large and coarse grasses or reeds furnish suitable food for the larvæ. It has been recorded that they develop on the roots of the Rudbeckia. Adults may be found active at any time from spring to fall and in sheltered places during winter.

REMEDIES.

Here is one of the pests against which we have no remedies which can be said to be truly satisfactory. Rotation of the corn with other crops has been the time-honored recommendation for it; but the writer has talked with farmers who had habitually practiced the most thoroughgoing rotation and still suffered severely. In the opinion of the writer, any beetle as active as this one is in the adult stage, and feeding on so wide a variety of plants, will have no difficulty in traveling a few hundred feet, or a few miles if necessary, to find a suitable place to deposit her eggs. Nevertheless, rotation will help *some*. Keeping corn off the lowlands will help *some;* thorough cultivation by interfering with the adults, eggs, and pupæ, will help *some;* and good fertilization by feeding and strengthening the plant, will help *some*. Incidentally, something may be accomplished by keeping all squash, melon, and like vines near the cornfield well poisoned to kill the adult beetles. For this use Paris green and air-slaked lime, at the rate of one ounce of the poison to one pound of the lime, or spray with the Bordeaux mixture and Paris green.

For further discussion of these several methods, see Rotation (p. 491), Fertilization (p 492), and The Ideal System (p. 492).

THE CORN-ROOT WEBWORM. *Crambus caliginocellus*, Clem., and related species.

Order *Lepidoptera*. Family *Pyralidæ*.

Description.—Whitish caterpillars with small black spots or specks on body, attaining a length of from one-half to three-quarters of an inch, attacking the young corn plant at or near the surface of the ground. Each caterpillar surrounds itself with a slight web.

Injury in North Carolina.—No specimens of this insect have been sent in during the last five years, and none of the complaints that have ever been received could be positively attributed to this pest. Yet we feel sure that it must do injury at times, for the adult moths are very common in grassy fields at Raleigh in summer, and the insect is one of wide distribution, occurring throughout the Atlantic States. The writer first became acquainted with it several years ago in Maryland. It would seem worth while, therefore, to introduce at least a brief account of the insect, that our farmers may be on the watch for it and report its first appearance.

Life-history and Habits.—The adult insect is a delicate little moth of silvery-gray color, which frequents grassy fields, where the eggs are laid in summer and fall. The larvæ normally live upon grasses, eating into the stems or bulbous roots at the surface of the ground. When corn is planted on land just from sod the larvæ are often already present in great numbers, and being deprived of their natural food of grasses, they attack the corn, eating into the stalk at the surface of the ground, each larva being somewhat protected by a loose web which acts as a barrier to predaceous enemies and parasites. When grown the larva is about three-quarters of an inch in length, yellowish-white, pinkish, reddish, or even of a reddish-brown color, being quite variable. In midsummer they change to the pupa state at or close to the base of the plant, and emerge as moths two weeks later. Eggs are at once laid in grass lands, where the partly grown larvæ pass the winter and are ready to commence feeding as soon as spring opens.

REMEDIES.

By avoiding corn immediately after sod much of the injury by this insect will be averted. If sod land is to be planted in corn, fall plowing will kill many of these insects by exposure or starvation.

See Rotation (p. 491), and The Ideal System (p. 492).

THE CORN BILL-BEETLE. *Sphenophorus callosus*, Oliv.

Order *Coleoptera*. Family *Calandridæ*.

(Also known as Bill-bug, Curlew-bug, Klew-bug, etc.)

Description.—A black, hard-shell beetle, little over one-half inch long, with strong down-curved beak or snout on head. Damages corn by puncturing the stalks at the surface of ground and eating tissue from inside the stalk. Worse on lowlands.

Injury in North Carolina.—This insect is primarily a pest of the low swampy lands of the eastern sections of our State. It has been recorded to occur (though not destructively) at Chapel Hill, in Orange County, but our complaints have all come from counties in the eastern or low sand-hill sections. In such localities it is one of the very worst of the corn pests.

The Structure of the Insect.—Most of the beetles (Order Coleoptera) have jaw attached directly to the head, as in the Potato-beetle and other well-known beetle pests. A large group of them, however, have the jaws located at the end of a stout bill or beak which curves downward, sometimes almost between the front legs. This Corn Bill-beetle, together with the Strawberry Weevil, Cotton Boll-weevil and Peach and Plum Curculio, belong to this group. In feeding these beetles thrust the beak into a plant and the inside tissue is then eaten out. On account of this peculiar structure and mode of feeding, it is not usually practicable to combat pests of this kind with poison; it certainly would not be practicable with this insect in cornfields. The very hard texture of the outside covering or shell of all beetles renders it very unsatisfactory to attempt to kill them with oil or soap solutions.

Life-history and Habits.—Although there are eight or ten distinct species of Bill-beetles that have been known to attack corn, yet all the specimens which have been sent to me with complaints have turned out to be the same species. In Illinois, Professor Forbes mentions some eight species, and in North Carolina we have as yet taken only four species of the group, while all the specimens sent seem to be the one species here treated. It is therefore evidently *the* Corn Bill-beetle, so far as injury in this State is concerned.

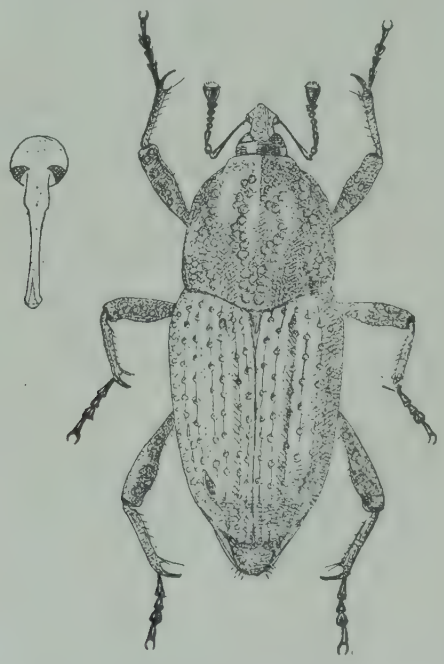


FIG. 5.—The Corn Bill-beetle, viewed from above, front view of head and snout shown at side. All enlarged.
(From Chittenden, Bureau Entomology, U. S. Dept. Agr.)

The general life-history of the different species of Corn Bill-beetles is quite similar, though they may differ in some details. The history of this particular species has never yet been carefully worked out, therefore there is room for slight error in the following account, but care has been taken to make it as accurate as possible.

The exact method of passing the winter is not known. The adult beetles appear in the cornfields when the corn is a few inches high and begin to do

damage by puncturing the stalks. In doing this injury they take a position on the stalk, head downward, at or near the surface of the earth, and by pressure and a little working sink the bill into the stalk, where they feed on the interior tissue. By working from side to side the insect may gouge out a much larger cavity on the inside of the stalk than would be expected from the size of the hole on the surface. They are said also to attack chufas, a forage crop commonly grown in the eastern part of the State.

The eggs are laid in low grassy or sod lands (not on the corn), especially those where rice or other grass-plants are growing which have thick bulbous roots. The eggs hatch to thick-bodied, fleshy, white, footless grubs which feed on the available roots, pupate in late summer or fall in the roots or near by, and emerge the next spring as adult beetles. It is our belief that there is but one brood each year.

Where Most Destructive.—It has been stated that the Corn Bill-beetle is more destructive in the lowlands in the eastern part of the State. It is worse on lands just from the sod of rice, sedges or other similar grasses. It is worse also on lands lying near streams and rivers, especially if they be subject to overflow. These few facts show at once the utility of the remedial measures here suggested.

REMEDIES.

The avoidance of corn in lands just from rice, sedge or similar grasses, will aid in mitigating the ravages of this insect. Or if corn must be planted on such lands, it is well to fall-plow and cultivate once or twice during the winter, if this be practicable without excessive injury to the land. If the corn be kept in the uplands instead of on the low bottomlands, injury will be avoided. Drainage to remove all surplus water will render the fields less attractive to them. Liberal cultivation and fertilization by strengthening the plants will enable them to withstand the attacks to which they might otherwise succumb.

For discussion of these several methods, the reader should see what is said under the head of Rotation (p. 491), Fertilization (p. 492), and The Ideal System (p. 492).

The Larger Corn Stalk-borer. *Diatræa saccharalis*, Fab.

Order *Lepidoptera*. Family *Pyralidæ*.

Description.—Whitish caterpillars with brown or black specks on body, reaching a length of about an inch when grown, injuring corn by boring into the stalk and (when corn is young) into the terminal growing part, causing weakness and distorted growth, rendering the plant worthless when the attack is severe. Most destructive during the latter part of May and during June. The adult moth measures about an inch from tip to tip of the expanded wings, is yellowish-brown in color and is an active flier.

Injury in North Carolina.—Only two of the letters giving report of injury are quoted below. The following from Mr. A. T. McCallum, Red Springs, Robeson County, dated June 17, 1902, has reference both to this insect and the Ear-worm (p. 511):

> Our corn crop, I am afraid, will be seriously damaged by worms if we cannot get something to destroy or check them. * * * I have one field of corn that I fear will be almost ruined if something cannot be done to check the work of the worms.

July 2, 1904, Mr. S. B. Alexander, R. F. D. No. 5, Charlotte, Mecklenburg County, says:

I enclose a worm that is very destructive to corn this year. It differs from the common Bud-worm. * * * Please give me the name and the method for destroying it.

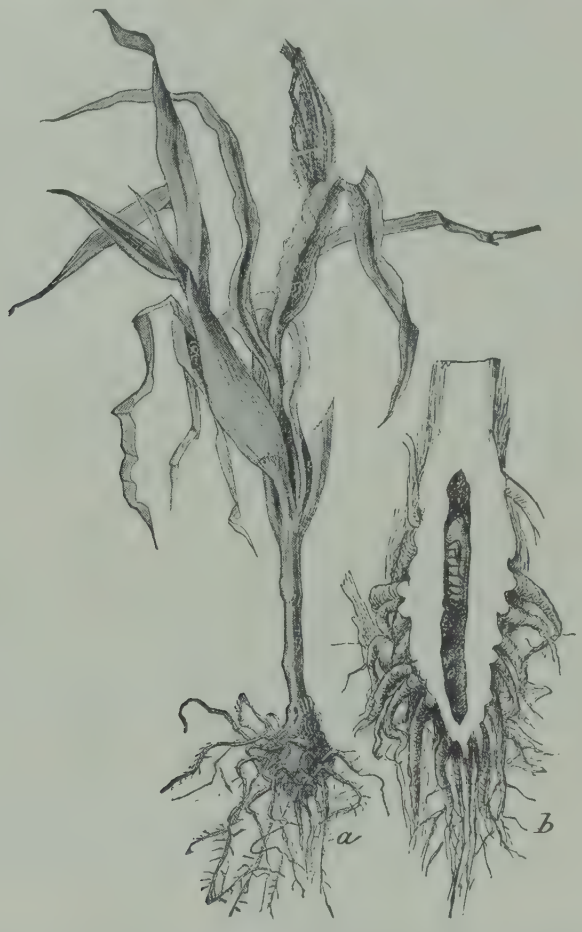


FIG. 7.—Work of the larger Corn Stalk-borer. *a*, appearance of young stalk badly injured. *b*, stalk cut open near root to show burrow and pupa inside.
(After Howard, Div. of Ent., U. S. Dept. Agr.)

Other reports of destructive work by this insect have been received from Columbus, Cumberland, Duplin and Edgecombe counties.

As will be seen from these records, it has been most destructive in the southeastern part of the State and, like the Cane-beetle, it will probably always be most destructive in the coastal-plain region.

In investigating the case reported in Mr. McCallum's letter we found that the outbreak was very serious, as many as six and eight of the larvæ being found in a single stalk, and from ten to fifteen per cent of the stalks were totally ruined.

This insect is not to be confused with the Sugar-cane Beetle, for the latter injures the stalk while in the adult hard-beetle state, while this Stalk-borer only injures the corn while in the soft caterpillar condition.

Life-history and Habits.—This insect is called the *Larger* Corn Stalk-borer in order to distinguish it from another somewhat similar borer of smaller size which has not yet been recorded in this State.

The injury by this insect usually becomes noticeable from the 10th to 20th of June, at which time the larvæ are growing rapidly and boring actively in the stalks. In Robeson County we found pupæ in stalks on June 30th, and from these the adult moths issued July 2d. The first brood of moths, therefore, appeared that year to emerge mainly about the first of July, though it is to be noted that Mr. Alexander, two years later, sent larvæ from Mecklenburg County on July 2; so in the higher and cooler sections they are probably always somewhat later in reaching maturity. The conditions of the season will also have an influence. The second brood of larvæ burrow into the stalks (which have of course become larger in the meantime), mostly in the first two joints above the ground, and their injury consists in weakening the stalk so that it is readily blown to the ground; whereas damage by the first generation results in serious injury to the crop, as it prevents the growth of both stalk and ears.

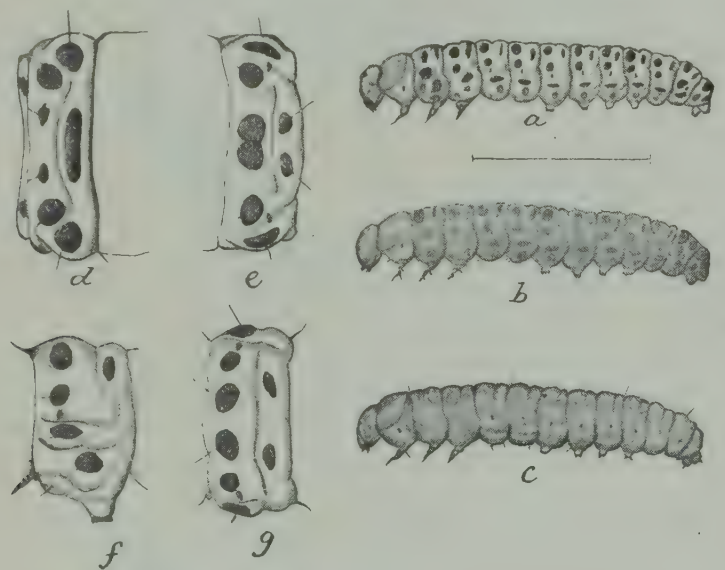


FIG. 8.—Showing larva of larger Corn Stalk-borer, *a*, *b* and *c* showing variations in the markings, etc. Natural length indicated by line below *a*. *d*, *e*, *f* and *g*, views of certain parts of body of larva.
(After Howard, Div. of Ent., U. S. Dept. Agr.)

The larvæ of the second generation become mature by harvest and then burrow down the center of the stalks to the root and there pass the winter in the larval state, changing to pupæ in the spring, from which moths then emerge to lay eggs for the spring brood of larvæ again.

The above is in part drawn from other published accounts of this insect, and we have not corroborated all the statements made. We have not actually observed what we know to be the second brood, though we have found pupæ, or pupa-shells, taken to be those of this insect, in cornstalks in winter. It may pass the winter here as a pupa, even if it winters as a larva further south—the point is not yet clear. It may be that the second brood attacks cane, sorghum or some of the wild reeds growing in lowlands which will furnish it with green food later into the fall than the corn would do.

If each larva simply burrowed into the stalk and remained inside until mature the case might not be so serious, but they have the destructive habit of leaving and re-entering the stalk again, so that each may make several holes, resulting in severe weakening of the plant.

Time of Injury.—The dates of the complaints that have reached this office have been as follows: In 1902, June 12, 14, 17 and 24; in 1904, July 2d. Dr. Howard, Entomologist of U. S. Department of Agriculture at Washington, says that "In 1891 it was found that of corn planted during the first and second weeks of April, 25 per cent was damaged; of that planted May 1st to 15th, 15 per cent was damaged; of that planted May 15th to 31st, 12 per cent was damaged; of that planted June 1st to 15th, 8 per cent or less was damaged. In fact, corn planted after the first of June was practically uninfested." The account does not state where these observations were made.

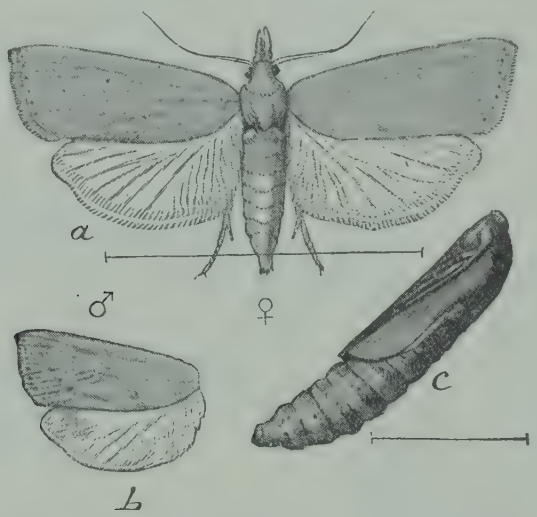


FIG. 9.—Pupa and adult of larger Corn Stalk-borer. *a*, adult moth. *b*, showing wings of male moth. *c*, pupa. Natural size of moth and pupa indicated by lines.
(After Howard, Div. of Ent., U. S. Dept. Agr.)

In 1902, in this State, corn which was not up until June 25th or later would evidently have escaped injury, at least from the first brood.

REMEDIES.

If the corn be not planted until from the first to the middle of June, much of the damage by this pest will be averted. Of course it may not be advisable to delay until so late; the farmer must judge for himself whether the insect is sufficiently destructive in his fields to make it worth while. Next to late planting the most important step is the *complete* destruction of all stalks as soon as possible after harvest. With sweet table varieties (which were considerably attacked in Robeson County) the stalks should be *pulled out*, roots and all, and burned as fast as the ears are gathered. Sowed corn, which is grown for forage only and not for grain, should, if infested, be cut as early as possible, the stalks promptly fed to stock, and the butts plowed or pulled out, piled and burned. These measures are to prevent the development of such of the second brood as are in the corn fodder. Sorghum and cane by being run through the roller to crush out the juice will furnish no opportunity for the insects to pass the winter in the stalks, but the butts should be carefully gathered and burned.

With field crops of corn the same principle should be followed. The fodder may be cut at the ground and shredded or made to ensilage, which will de-

stroy such of the insects as are in the stalks at the time. If the field was badly infested it will be well worth while to carefully gather and burn all the butts. Our common Southern custom of "*pulling*" the fodder and allowing the stalks to stand is favorable to this insect. If the fodder is to be pulled and it is desired to allow the stalks to rot in the field for the humus, then they should at least be beaten down and plowed under *deeply* as early as possible, so that the insects will not be able to mature and emerge. The rotation of corn with other crops will also aid to some extent in abating injury, while good fertilization will aid the plant to recover from attack. Last, but not least, it should be remembered that the adult moths are active fliers and can readily make their way from the field of the careless farmer into that of his careful neighbor. In fighting this insect, therefore, much will depend upon the mutual co-operation of all the farmers in a locality, all using the same methods and at the same time.

The reader should see also what is said under the head of Rotation (p. 491), Fertilization (p. 492), Disposition of Remnants (p. 492), and The Ideal System (p. 492).

The Chinch Bug. *Blissus leucopterus*, Say.

Order *Hemiptera*. Family *Lygaeidæ*.

Description.—Small bugs about one-fifth of an inch long, blackish in general color with white wings; the young bugs reddish. Appear at times in great numbers in wheat, oats, corn, millet and timothy. There are both long-winged and short-winged forms. Most destructive in the Piedmont region in this State.

Injury in North Carolina.—Something over twenty-five separate complaints of this insect have come to this office, most of them referring to its injuries to

Fig. 10.—Showing various stages in growth of Chinch Bug. *a* and *b*, eggs. *c*, *e*, *f* and *g*, stages in growth of young bugs. *d*, *h* and *j*, legs. *i*, sucking beak through which the insect sucks sap from the plant. All enlarged, natural sizes indicated by lines, etc., at side of figures.

(After Riley, Div. Ent., U. S. Dept. Agr.)

corn. Those living in the region of chinch-bug injury well know of their destructiveness; others may take our statement for it that when conditions favor their increase, they appear in swarms of millions (no exaggeration), sucking the sap from the plants until they dry up as if by drought or fire. At such times the destruction is often complete, every single individual stalk being sucked to death (not eaten) by the insects.

Life-history.—The adult bugs pass the winter under rubbish, grass, weeds, etc., along the borders of fields, in old corn-stalks, etc. In Kansas Mr. Marlatt of the U. S. Department of Agriculture found them excessively abundant in tufts of a grass growing in sandy lands, and Mr. Schwartz of the U. S. National Museum records finding them abundantly in very early spring in tufts of grass along the seashore at Fortress Monroe, Va. From these facts it is believed that such tufts of grass in sandy places are preferred for hibernating quarters, but at least the writer knows that at Raleigh they are not infrequently found under such rubbish as before mentioned. The adults emerging in spring fly about quite freely and locate in grass, wheat or oat fields, long before the corn is up or even planted. Here they feed by sucking the juices from the plant. Soon they begin to mate and lay eggs, which in from two to three weeks hatch to small reddish bugs which also suck the juices from the plant. The young bugs are active and look a good deal like the adults in general structure, except that they are different in color (red, while the adults are grayish-black with wings) and the young bugs have no wings. About the time of harvesting wheat these young bugs come to maturity, and then they, now being adults, proceed to spread to cornfields for new food, which they do almost entirely by *walking* instead if flying, though they have wings. They now deposit eggs at the base of the corn plants, from which another lot of young are hatched. These young bugs live on the corn, attain maturity and at the approach of winter seek winter quarters as already mentioned. There are, so far as is positively known, only two broods, the first maturing about the time of wheat harvest, which usually varies from about June 10th (Alamance County) to June 18th (Catawba County), and the second brood reaching maturity later in the summer or fall, the individuals of which pass the winter.

Habit of Migrating.—In migrating to the cornfield after the wheat or oats have been cut, the adult bugs nearly always crawl, although they have wings and can evidently fly. It is this curious habit on the part of the insect that gives us a chance to prevent their entrance into a cornfield, as will be seen under the consideration of remedies.

A Sucking Insect.—The Chinch Bug, instead of having jaws like the grasshoppers, caterpillars, and other insects which eat the foliage of plants, is provided with a jointed beak attached to the head, which is thrust into the plant and through which the juices are sucked. It can feed only on the liquid juices of the plant which are drawn from inside the tissue. It cannot, therefore, be poisoned by the use of Paris green or other poisons which are applied to, and must remain on, the exterior surface of the plant. The effect of their attacks is to dry out and wilt down the plant as if from fire or lack of water.

Long and Short Wings.—There are two different forms or races of the Chinch Bug. One race has the wings long, so that when folded down they reach to the tip of the body, while the other has the wings short, not reaching more than half way to the tip. It is said by high authority (though the writer has not corroborated the statement in North Carolina) that the short-winged form is more prone to attack grasses, such as timothy and millet, while it is the long-winged form that is the chief enemy of corn. All the adult bugs that we have in our collection are of the long-winged type. Here is a chance for farmers in Rockingham and other of our corn and hay counties to observe an interesting point, and send to this office specimens to prove any

discoveries they may make. Of course it is to be expected that both forms will be found on both grasses and grains, but it will be interesting to determine which form of the insect *predominates* in each crop.

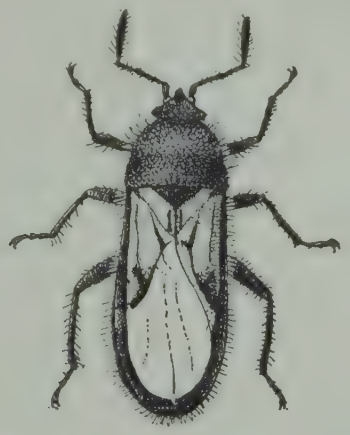


FIG. 11.—Adult Chinch Bug, showing dark color of body and white wings. Much enlarged. Insect in reality about one-eighth inch in length. This is the long-winged form of the insect.
(After Webster, Div. Ent., U. S. Dept. Agr.)

Dry Weather Favors Chinch Bugs.—Usually Chinch Bugs are more destructive in dry weather, and in wet seasons they are not so noticeable. This is apparently because of certain epidemics of disease among them which are more virulent during wet seasons. It is well for farmers to know this, as it is often convenient to be able to forecast, even though imperfectly, their probable appearance in any locality in destructive numbers.

Distribution.—There is some evidence that the Chinch Bug was originally a native of Mexico or Central America and that from thence it has spread northward. In the United States it is most widely distributed and most destructive in the States of the Middle West—Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas and others. There is a belt of country east of the Alleghany Mountains in which it is also destructive. In North Carolina the western limit of its destructive area may be placed at, or close to, the foot-hills of the Blue Ridge, and the insect is found from there to the coast, though not usually serious in the low, sandy plains of the east. It is primarily a pest of the Piedmont region in this State.

Natural Enemies.—On account of a very disagreeable odor possessed by these insects one would not expect to find many enemies which would devour them. Although a large number of birds doubtless eat them to a greater or less extent, the quail or common "Bob-white" stands pre-eminently at the head of the list, and the blackbirds, bobolinks and sparrows follow.

But by far the most prevalent natural enemies of the Chinch Bug are certain diseases, particularly those of a fungous nature, which not infrequently save many thousand of dollars to the farmers by destroying the bugs. One of these fungous diseases, known as the Muscardine fungus, has been considerably experimented with in Kansas and some other States, to see if it could

not be artificially introduced into fields where the bugs were doing injury; but it is so slow to get started, and so uncertain in its results that it has never come into general use.

REMEDIES.

The best remedies, and those most widely and most successfully used, consist in barriers of some kind so placed that the bugs cannot cross them to gain access to new fields. For this purpose, a deep furrow, a strip of plowed and finely pulverized soil, a narrow strip of tar laid in a furrow or even simply on the ground—these all serve to check the insects in their march from one field to another. If a furrow is to be used it should be deep and so run that the earth shall be thrown toward where the bugs are already congregated, so that they will have to *climb* the *steep side* of the furrow. If the insects are found in the oat stubble, for example, one or two such furrows should at once be plowed around the field to prevent their escape. Two furrows a few feet apart will of course be just twice as effective as one.

The furrow may be made still more effective by digging holes with regular post-hole digger every ten to fifteen feet in the bottom of the furrow. The bugs falling in the furrow will run along trying to find an outlet, and presently falling in the holes, will be quite unable to escape.

Infested stubble can be burned over, if thick and dry enough, or plowed deeply and rolled or dragged to finely pulverize the surface. Of course the more of these methods be combined the better will be the protection.

Where a part of the cornfield has become infested the same methods may be employed, separating the infested from the uninfested parts of the field, so as to check their further advance.

The success of these methods is based upon the fact that the adults which mature in June *crawl* rather than *fly*, even though they do have wings. And as their legs are short and their bodies comparatively inelastic, they find it difficult to overcome obstacles such as have been mentioned; furrows, strips of tar, or finely pulverized soil making very effectual barriers to their progress. Of course a sudden dash of rain may destroy the barriers, which must be replaced at once.

As a direct remedy that can be used to save corn already infested, nothing better can be suggested than kerosene emulsion prepared and applied as follows: Dissolve a half pound of soap in a gallon of water by boiling. Remove from the stove and add two gallons of kerosene and mix thoroughly by pumping this fluid back into itself by means of an ordinary spray pump. When the emulsion is formed it will look like buttermilk. To each quart of this mixture add fifteen quarts of water and sprinkle or spray upon the corn, preferably before 10 A. M., or after 3 P. M. The bugs should be washed off so that they will float in the emulsion at the base of the plant. A teacupful to a hill is usually sufficient, but the quantity must vary with the number of bugs infesting the corn. The cost of material (not work) per acre of corn treated will be about seventy cents where the plants are badly infested, and about thirty cents when moderately infested. A knapsack pump is as good as any to use in this work, and the spray should be so directed down the stalk and against the insects as to knock as many off the plants as possible. Of course the emulsion will only affect those bugs that are wetted by it. We have never used the spray, but know that it has been used successfully in some of the Central States.

As some of the adult insects pass the winter under rubbish and in corn-stalks, much may be done by clearing up and burning rubbish and so disposing of the stalks that they shall not furnish suitable hibernating quarters.

In closing this discussion of the remedial measures for the Chinch Bug, it is of interest to read the following letter from one who used the furrow method. This letter is here given because there are so many who believe that such a remedy will not prove satisfactory.

* * * Will say that I first had deep furrows, throwing the dirt from the corn and then bedded back to the corn. In this way the bugs were held in check, and destroyed only ten or twelve rows that they first appeared in. Thanking you for your prompt reply, I am,

Very truly, W. N. Boyd.

Warrenton, Warren County, N. C., October 19, 1904.

See also, Disposition of Remnants (p. 492).

The Corn Ear-worm. *Heliothis armigera*, Hubner.

Order *Lepidoptera*. Family *Noctuidæ*.

Description.—A grayish, greenish, reddish or brownish caterpillar (very variable in color), about one and a quarter inches long when grown, which eats into the ears of corn, often several in a single ear. The adult a light yellowish-brown moth with wings expanding from one to one and a quarter inches from tip to tip.

Injury in North Carolina.—Among our destructive insects we think that this stands near the head, both in the total amount of damage done and the difficulty of combating it. According as it attacks different parts of the several crops, it is known as the Cotton Boll-worm, the Tobacco Bud-worm, the Tomato Fruit-worm, the Corn "Shatter-worm" (when in the top of corn) and the Corn Ear-worm. The insect also attacks other plants to more or less extent; has been reported burrowing in the pods of cowpeas, in the seed-pods of tobacco and even occasionally in fruits. Here, however, we are principally concerned with its injuries to corn, and in this connection the following records may be of interest:

In latter part of May and early June, 1902, complaints were received from Mr. A. T. McCallum at Red Springs and Mr. A. J. McKimmon of Maxton, both places being in Robeson County. In response to these complaints the writer made a personal investigation, giving special attention to the case at Maxton, which was especially serious. Mr. McKimmon had about thirty acres planted in sweet corn for shipment to northern markets, but scarcely an ear could be found which was not infested with *several* of these larvæ. As many as eleven were found in a single ear. The crop was fully seventy-five per cent (if not ninety-nine per cent) lost from the ravages of this pest.

Early in January, 1903, Mr. R. W. Livermore, also of Red Springs, wrote asking about methods of combating this pest, which had done him serious injury the year previous. From his letters, dated January 6th and 8th:

* * * The worm which was doing the damage in my early corn last year was the worm which bores into the ear when the corn is ripening. I am inclined to think that this worm shuts out the early sweet-corn crop for this section as a shipping crop to be depended upon.

Life-history and Habits.—It seems certain that the usual method of passing the winter is as a pupa, under the surface of the ground. The adult moths

FIG. 14—The Corn Ear-worm, showing the destructive larva at work in ear of corn.
(After Quaintance, Bureau Ent., U. S. Dept. Agr.).

come out in spring and, being very active fliers, wander whither they will in search of nectar-bearing flowers or suitable plants upon which to place the eggs. When corn is the object of attack the eggs are laid on the silk, though the early brood of moths often deposit them in the terminal growing part of the plant, in which case the caterpillars eat the leaves and tassel and are called "Shatter-worms." The great majority of the eggs are laid on the silk and the larvæ work down the silk, or bore directly through the husk to the forming ear, where they feed on the kernels and soon attain full growth, when they burrow out through the husk and enter the ground to pupate. There are a number of broods during the summer, the last brood passing the winter in the pupa state and emerging as adults in the spring.

Corn is not much attacked after the kernels begin to harden, the insects then turning to other plants, such as tomatoes, tobacco and cotton. There are several broods each season, probably four or five in the greater part of this State.

FIG. 15.—The Corn Ear-worm, showing larva at work on blades of corn. When it does this injury it is sometimes known as the "Shatter-worm."
(After Quaintance, Bureau Ent., U. S. Dept. Agr.)

North Carolina Notes.—The notes here given throw some light on the time of emergence, etc., of the insects in this State:

In 1900, on September 18th, Mr. D. L. Wolff, R. F. D. No. 1, Pinnacle, Surry County, sent in adult moths which were captured when on tobacco flowers.

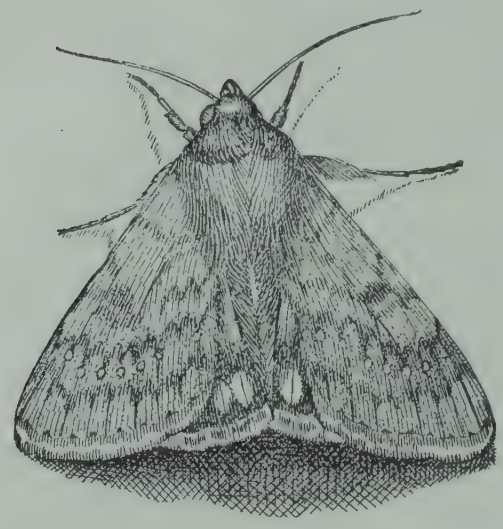


FIG. 16.—The Corn Ear-worm, showing adult moth in natural position with wings not spread. About twice natural size.
(After Quaintance, Bureau Ent., U. S. Dept. Agr.).

In 1902, at Raleigh, adults were observed for the first time in the terminal blades of corn on May 15th. On the 18th eggs were abundant on new silk (it was early corn) and thereafter larvæ were abundant in the ears.

In 1905, on May 18th, Mr. S. O. Lazenby, R. F. D. No 4, Statesville, sent in a specimen of the adult moth.

These notes show that the adults are abroad early in the spring and also late in the summer, into the fall. The finding of larvæ mature, or nearly so, at Maxton on May 31st, is an evidence that they reach maturity quickly. There must, therefore, be quite a number of different broods.

REMEDIES.

When this insect attacks other plants, especially cotton, it is ordinarily recommended to plant an occasional row of corn with the cotton for the purpose of inducing the insects to attack the corn so that the other crop will be spared. This is an evidence that the insect prefers corn to all other food. This paves the way for a frank statement of the fact that no satisfactory remedy for the pest on corn is known. It is one of those enemies of the corn against which we are well-nigh helpless. Such methods as may be employed with reasonable hope of some return are mentioned below.

As the insect evidently hibernates in the pupa state, fall plowing will expose and (presumably) kill many of the pupæ that happen to be in the land, thus reducing the number of adult moths for the next season. But it should be remembered that the last brood to mature in the fall are those which lived in the bolls of cotton or the seed-pods of tobacco, hence it is *these* lands that should be fall-plowed, and not necessarily the land that was, or is to be, in corn.

As the eggs are laid principally on the silk, and as these eggs of course are laid only by the adult moths, there is the possibility of dodging much of the damage by planting the corn at such a time that it shall be in silk *between* two broods of the adult moth, and thus escape. But the exact time for planting to escape injury will of course vary according as the locality is east or

west, north or south, low or elevated, and according as the season is hot or cold, wet or dry, for all these things have an influence on the time of emergence of the adult moths.

If a farmer should make a succession of plantings every four days to a week apart and covering a period of six weeks or more, and if the season were an average one in all respects, he could then notice to see which planting was least and which most affected and thus could draw a conclusion as to the *average* date to plant to escape injury on his own farm. But of course every season will have its hot and cold, wet and dry spells, etc., so that the date that was best in one season might be the worst the next, and the real benefit after all would be problematical, uncertain and largely accidental.

Where practicable it is entirely possible to kill the larvæ by pinching the tips of the ears by hand or, where it can be done without damage, by cutting off the ends of the infested ears and feeding them to stock. If the hand-pinching method be used the work should be done several times to kill as many as possible, for young ones will likely escape each time.

Weevils (Various Species).

Orders *Lepidoptera* and *Coleoptera.*

Description.—Small insects which in the adult or larval state, or both, injure grain by eating into the kernels when stored or by eating the meal or other products. Adults are small moths or beetles.

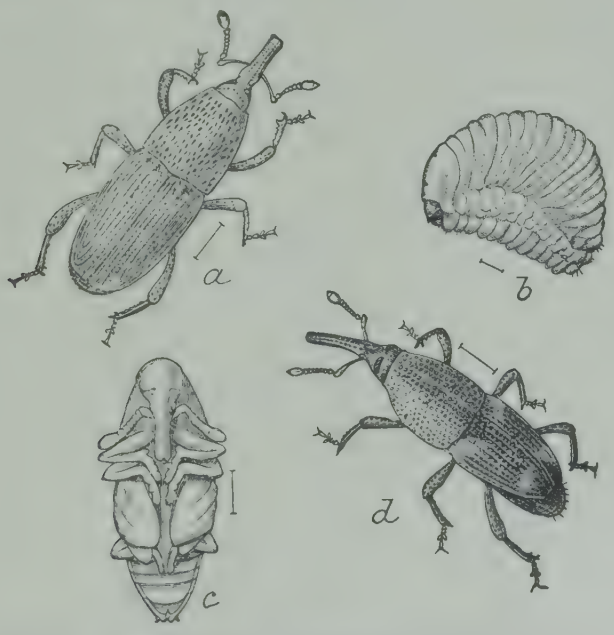


Fig. 17.—Grain Weevils. Showing two closely related species at *a* and *d*, a larva at *b* and a pupa at *c*. All enlarged, natural length indicated by lines.
(After Chittenden, Div. Ent., U. S. Dept. Agr.)

Injury in North Carolina.—There are some half-dozen or more different species of insects which are commonly called "Grain Weevils." In the case of those in which the adult insect is a moth the damage is all done by the larvæ, but the beetle weevils are often destructive in both adult and larval state.

Most of the complaints which have come to this office regarding weevils in grain have had reference to wheat; but it is well known that corn is likewise injured, and we have personally observed such damage in several instances.

General Discussion of Life-history of Grain Weevils.—This must necessarily be a general discussion, as there are a number of different species, the life-history of no two being exactly alike in all particulars.

The adult insects are moths or beetles, and are of small size. These lay their eggs on or in the grain or husk and the larvæ at once eat into the kernels. Usually a larva reaches full growth in the same kernel in which it first started, and pupates there also, emerging a few days later as an adult. In the case of weevils infesting meal, bran and other ground products, the larvæ burrow around in the material, frequently spinning a sort of web, which ties little masses of the grain together. Meal and other products thus infested are apt to become mouldy and unhealthy as food for both man and beast. Where the whole grain is infested the vital germ is often eaten out, thus spoiling the grain for seeding purposes.

In our Southern States some species of weevils fly in the fields in summer and lay eggs on the grain before it is gathered. Adult weevils have also been found passing the winter in the remnants of fodder, where this had been "pulled."

REMEDIES.

In the case of corn, much injury may be prevented by storing the grain in the husk where this can be done conveniently; but even this is a disadvantage, since if it be so stored it is not so easy to see when weevil damage is being done. If the grain be so stored an occasional examination should be made.

In storing shelled corn it may be placed in bins which should be absolutely tight, and the top of each bin should then be covered with a complete layer of lime or ashes to a depth of an inch. The insects will be slow to go through it to the corn. Of course, this is only practicable for those bins that are not being continually disturbed.

But for the grain that has actually become infested there is one good remedy. Carbon bisulphide, a foul-smelling chemical costing about twenty-five cents per pint, is an entirely satisfactory remedy when properly used. The grain must be in a tight bin so that the fumes of the liquid will not escape. The bisulphide should be used at the rate of one and a half tablespoonsful to each one hundred pounds of grain to be treated. The weight of the grain may be estimated, as absolute exactness is not essential. (Ear corn weighs about seventy pounds per bushel, shell corn fifty-six pounds.) The liquid may be thrown directly on the grain and the bin should then be covered with oil-cloth or heavy blanket to prevent escape of the fumes. The whole dose of bisulphide should not be thrown into the same spot, but in several places, so that the fumes shall penetrate all parts of the bin. Leave covered for a day. Another method of applying the bisulphide is to place it in saucers or shallow pans, place them in the bin and cover as before mentioned. The rapid evaporation soon fills the bin with the poisonous fumes, which, being heavier than air, sink down through the grain and kill the insects in it.

This treatment will kill all adult weevils and their larvæ, but it is not always fatal to the eggs; hence a second treatment may be necessary. An examination of the grain should therefore be made from time to time to ascertain its condition, and the remedy applied whenever needed.

This treatment is cheap, effective, easy to apply and does not hurt the grain in the least, either for planting or food purposes. It is the standard remedy for insects in stored grain, flour, meal, groceries, etc. Failure in its use is almost invariably due to a poor quality of bisulphide, faulty bins, or mistakes in the manner of using.

Caution.—The bisulphide is like benzine in its nature, being very inflammable, and no light or fire of any description can be brought near while the fumigation is going on, not even a lamp, cigar or pipe. After the fumigation is finished, open the bin and air it out thoroughly. If these cautions are heeded the material is safe to use.

See also, Disposition of Remnants (p. 492), and The Ideal System (p. 492).

OTHER CORN INSECTS OF LESSER IMPORTANCE.

In the foregoing pages we have discussed those insects which are really destructive corn pests in this State. There are, however, a large number of other insects which are to be found frequenting the corn plant, some more or less destructive and others there for pollen, nectar, or in search of other insects. We will here consider briefly several of those that are most likely to attract the attention of the observing farmer.

Grasshoppers (Order *Orthoptera*).—There are a number of different species of grasshoppers which attack corn, sometimes proving quite destructive. Some of these appear full-winged when the corn first gets well started in spring, while others appear first in the young wingless state and acquire wings later. When serious the grasshoppers may be combated more or less successfully by the use of poisoned baits as described for Cutworms (p. 498).

Root-lice (Order *Hemiptera*).—Frequently on pulling up a stalk of corn small gray lice will be found clustered on the roots. While we have never had complaint of this and have therefore never had the insect identified, we take it to be the same species as the ordinary Corn Root-louse which is so destructive in some of the Central States. These lice are often accompanied by ants which go there to get the honey-dew, a sweetish substance which the lice secrete. The ants have nothing directly to do with the reproduction of the lice. When abundant enough to be serious the root-lice may be combated by rotation of corn with other crops. Plowing up of infested lands immediately after removal of the crop will also tend to reduce their numbers.

Flea-beetles (Order *Coleoptera*).—There are certain small, dark-colored jumping beetles which sometimes appear on corn in considerable numbers, eating small holes in the blades. Beetles of this type are frequently called "Flea-beetles" from their power of jumping quickly and for a considerable distance when disturbed. Ordinarily these insects will not do sufficient damage to warrant remedial measures, but if so we presume that relief could be gained by sowing lime or sifted ashes and Paris green broadcast through the field. These should be mixed at the rate of one ounce of the poison to one pound of the lime or ashes, and the application should preferably be made in early morning while the dew is on the plant.

White Grubs (Order *Coleoptera*).—These are sometimes destructive to the young roots of corn, especially in land just from sod. The adult insects deposit the eggs principally in sod lands and the grubs feed on the roots of the grasses.

If the grass lands be plowed up and put in corn the grubs have no choice but to eat the corn. The remedy consists in avoiding lands just from sod for the first year or two, as it takes two years for some of the species of White Grubs to reach maturity.

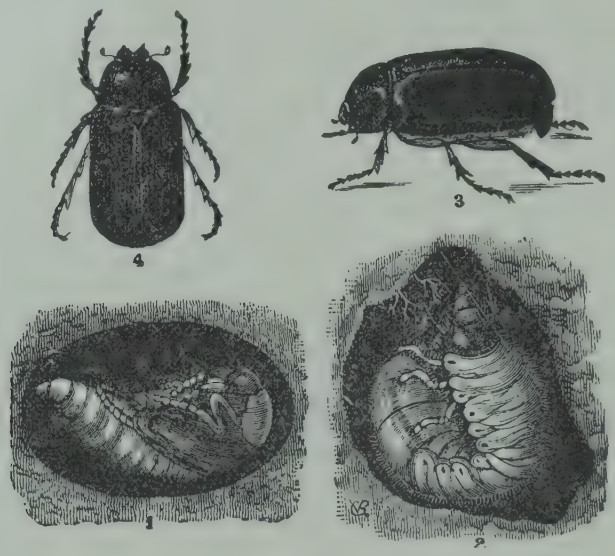


FIG. 18.—White Grubs. Showing adult beetles at *3* and *4*. Larva eating roots of plants at *2*, and pupa at *1*.
(After Riley, Div. Ent., U. S. Dept. Agr.)

Lady-beetles (Order *Coleoptera*).—One of our most common Lady-beetles is frequently seen on corn, where it feeds to some extent on the pollen, blades and the soft kernels. This is the Thirteen-spotted Lady-beetle (*Megilla maculata*). The species also feeds to some extent on other insects and its

FIG. 19.—Lady-beetle (*Megilla maculata*) from which a parasite has emerged and spun its cocoon beneath the insect. Slightly enlarged, size of beetle indicated by line above. Lady-beetles of this species parasitized in this way may frequently be found on blades of corn.
(After Riley, Div. Ent., U. S. Dept. Agr.)

larva is entirely insectivorous in its diet, feeding on plant-lice, slugs, etc. Frequently specimens of this beetle may be found on blades of corn standing over a small silken cocoon of yellowish or brownish color.

Such a cocoon contains a parasite, the larva of which has issued from the beetle. In a few days the adult parasite emerges from the cocoon as a small winged wasp-like creature, which goes off to seek a Lady-beetle victim. The beetle invariably dies soon after the parasite emerges.

Stinging Caterpillars (Order *Lepidoptera*).—There are two kinds of caterpillars frequently found on corn which if brushed against carelessly may produce painful stings. One of these is known as the Saddle-back Caterpillar

(*Sibene stimulea*), so called from the peculiar saddle-like looking markings in the middle of the back. This caterpillar when grown is about an inch long. There are two projections at each end of the body which are directed upward and outward, and these projections as well as other parts of the body are armed with sharp brittle spines which readily pierce the skin and break off. The general color of the larva is greenish, with a reddish-brown patch resembling the saddle, and a similar patch at each end of the body from which the projections arise. The caterpillar when grown spins a cocoon from which it comes out as a brownish moth. There seems to be but one annual brood, the adult moths issuing in spring or early summer. Ammonia, bicarbonate of soda, or even strong brine, are recommended as antidotes for the sting.

Our other species of stinging caterpillar is the larva of the Io Moth (*Automeris io*). This is a rather handsome pea-green caterpillar attaining a length when full grown of two inches, with a purple stripe down each side of the body, the whole body armed with yellowish spines which are borne in clusters on little warts or tubercles. When grown the larva spins a brownish silken cocoon within which it transforms to a handsome moth, the males being yellowish and expanding two inches from tip to tip of the wings, and the females yellowish-brown and expanding as much as three inches in large specimens. In both sexes the hind wings are marked with conspicuous eye-spots.

Other Caterpillars (Order *Lepidoptera*).—Various caterpillars of many kinds may be found on the corn plant, all transforming to moths of some kind. Most of these, however, are not serious, or if so, are only destructive in sporadic outbreaks.

In concluding this BULLETIN it is but fair to state that where the personal observations of the writer or the records of the office have not been sufficient for the purpose, other writings have been freely drawn upon, among which none have been more freely consulted than Sanderson's "Insects of Staple Crops."

It is well also to quote from one of the first paragraphs: "These considerations show us plainly that in combating many of the insect pests of corn, we must rely on such methods of culture and handling of the crop as shall render it least liable to injury. With any crop of low commercial value, such as corn, cotton, wheat and the like, *prevention* is the watchword in dealing with insects pests."

The writer will welcome correspondence with corn-growers who make use of the suggestions contained herein, and who carefully watch the results. He also desires to be promptly informed in case of any serious outbreak of any corn pest not mentioned in these pages.

THE GLOOMY SCALE.

A Serious Pest on Red and Silver Maples, Making it Advisable to Abandon Them, and to Plant More Largely of the Norway and Sugar Maples.

A species of scale-insect known as the *Gloomy Scale* (which is related to the San José Scale, but is entirely distinct) has come to be a very serious pest on maple shade trees. From the nature of the case it is difficult to combat. In the first place the outer scale seems to be much thicker and more resistant to remedies than is the case with most other scale-insects. Secondly, the fact that the shade trees which it infests grow to be very tall and are often placed in inaccessible situations, close to houses, etc., makes it practically impossible to spray them. Trees that are not infested when planted quickly become infested from other trees when set in villages or towns.

Fortunately, investigations by Mr. Z. P. Metcalf, Assistant Entomologist, have shown us a possible way to reduce the difficulty. He finds that while the Gloomy Scale is very serious on the "Soft Maples" (that is, Red Maple and Silver Maple), yet the "Hard Maples" (Sugar Maple and Norway Maple) are apparently free from attack, even when grown close to the others.

We believe, therefore, that the most efficient and logical method of suppressing the injury done by the Gloomy Scale is to abandon the Red Maple and Silver Maple, and to plant the Sugar Maple and Norway Maple instead—just on the same principle as fruit-growers plant varieties of pears which are most resistant to blight, or which are least attacked by San José Scale.

We believe that nurserymen will do well to advise their customers in catalogues and in correspondence, that the *Sugar Maple* and *Norway Maple are preferable,* and advise them *against the use of the others.* We have taken pains to look into the matter thoroughly this winter and are forced to that conclusion. An examination of maple shade trees in several places, notably in Greensboro, Raleigh and Red Springs (Robeson County), shows plainly that the Sugar and Norway Maples do better. There are many Red and Silver Maples now dying from this pest in these places, while Sugar and Norway Maples alongside are flourishing. No doubt the same conditions prevail throughout the eastern and piedmont sections. Furthermore, Mr. Ashe, Forester of the State Geological Survey, informs us that the Red and Silver Maples are not so desirable, even if they do thrive; that they do not make so good a shade, and are more easily broken by storms. He gives first preference to the Southern Sugar Maple.

We have not yet had opportunity to determine the status of this pest in the western (mountain) part of the State, but as the Gloomy Scale is rather a southern species in its distribution, it may not be serious in our western section, where the climate is cool and more like that of the Northern States.

I. ANALYSES OF FERTILIZERS, FALL SEASON, 1907; SPRING SEASON, 1908.

By B. W. Kilgore, State Chemist,

and

W. G. Haywood, J. M. Pickel, L. L. Brinkley and S. O. Perkins,
Assistant Chemists.

The analyses presented in this Bulletin are of samples collected by the fertilizer inspectors of the Department, under the direction of the Commissioner of Agriculture, during fall months of 1907 and the spring months of 1908. They should receive the careful study of every farmer in the State who uses fertilizers, as by comparing the analyses in the Bulletin with the claims made for the fertilizers actually used, the farmer can know by, or before, the time fertilizers are put in the ground whether or not they contain the fertilizing constituents in the amounts they were claimed to be present.

TERMS USED IN ANALYSES.

Water-soluble Phosphoric Acid.—Phosphate rock, as dug from the mines, mainly in South Carolina, Florida and Tennessee, is the chief source of phosphoric acid in fertilizers.

In its raw, or natural, state the phosphate has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water and is not in condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid.

Reverted Phosphoric Acid.—On long standing some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid, and is thus an intermediate product between water-soluble and the original rock.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

Available Phosphoric Acid is made up of the water-soluble and reverted; it is the sum of these two.

Water-soluble Ammonia.—The main materials furnishing ammonia in fertilizers are nitrate of soda, sulphate of ammonia, cotton-seed meal, dried blood, tankage, and fish scrap. The first two or these (nitrate of soda and sulphate of ammonia) are easily soluble in water and become well distributed in the soil where plant roots can get at them. They are, especially the nitrate of soda, ready to be taken up by plants, and are therefore quick-acting forms of

ammonia. It is mainly the ammonia from nitrate of soda and sulphate of ammonia that will be designated under the heading of water-soluble ammonia.

Organic Ammonia.—The ammonia in cotton-seed meal, dried blood, tankage, fish scrap, and so on, is included under this heading. These materials are insoluble in water, and before they can feed plants they must decay and have their ammonia changed, by the aid of the bacteria of the soil, to nitrates, similar to nitrate of soda.

They are valuable then as plant food in proportion to their content of ammonia, and the rapidity with which they decay in the soil, or rather the rate of decay will determine the quickness of their action as fertilizers. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion, or all, of the growing season, it is better to have a fertilizer that will become available more slowly, so as to feed the plant till maturity. Cotton-seed meal and dried blood decompose fairly rapidly, but will last the greater portion, if not all, of the growing season in this State. While cotton seed and tankage will last longer than meal and blood, none of these act so quickly, or give out so soon, as nitrate of soda and sulphate of ammonia.

Total Ammonia is made up of the water-soluble and organic; it is the sum of these two.

The farmer should suit, as far as possible, the kind of ammonia to his different crops, and a study of the forms of ammonia as given in the tables of analyses will help him to do this.

FORM OF POTASH IN TOBACCO FERTILIZERS.

Tobacco growers are becoming yearly more disposed to know the form of potash, whether from kainit, muriate or sulphate, which enters into their tobacco fertilizers. Considerable work of this kind has been done for individuals, and we now determine the form of potash in all tobacco brands, for the benefit of tobacco growers.

The term potash from muriate, as reported in the analyses, does not mean, necessarily, that the potash was supplied by muriate of potash. Sulphate or some other potash salt may have been used, but in all fertilizers where the term potash from muriate is used, there is enough chlorine present to combine with all the potash, though it may have come from salt in tankage, kainit or karnalite. As the objection to the use of muriate of potash in tobacco fertilizers arises from the chlorine present, it does not matter whether this substance is present in common salt or potash-furnishing materials.

The use of sulphate of potash where there is chlorine present in the other ingredients of the fertilizer will not prevent the injurious effect of the chlorine. The term potash from muriate in our analyses, therefore, means that there is sufficient chlorine present in the fertilizer from all sources to combine with the potash to the extent indicated by the analyses.

VALUATIONS.

To have a basis for comparing the values of different fertilizer materials and fertilizers, it is necessary to assign prices to the three valuable constituents of fertilizers—ammonia, phosphoric acid, and potash. These figures, expressing relative value per ton, are not intended to represent crop-producing power,

or agricultural value, but are estimates of the commercial value of ammonia, phosphoric acid and potash in the materials supplying them. These values are only approximate, as the cost of fertilizing materials is liable to change as other commercial products are, but they are believed to fairly represent the cost of making and putting fertilizers on the market. They are based on a careful examination of trade conditions, wholesale and retail, and upon quotations of manufacturers.

Relative value per ton, or the figures showing this, represents the prices on board the cars at the factory, in retail lots of five tons or less, for cash.

To make a complete fertilizer the factories have to mix together in proper proportions materials containing ammonia, phosphoric acid and potash. This costs something. For this reason it is thought well to have two sets of valuations—one for the raw or unmixed materials, such as acid phosphate, kainit, cotton-seed meal, etc., and one for mixed fertilizers.

VALUATIONS FOR 1907.

In Unmixed or Raw Materials.

For phosphoric acid in acid phosphate	4	cents per pound.
For phosphoric acid in bone meal, basic slag and Peruvian guanó	3½	cents per pound.
For ammonia	15½	cents per pound.
For potash	5	cents per pound.

In Mixed Fertilizers.

For phosphoric acid	4½	cents per pound.
For ammonia	16½	cents per pound.
For potash	5½	cents per pound.

The valuations decided on this season, for reasons already given, are:

VALUATIONS FOR 1908.

In Unmixed or Raw Materials.

For phosphoric acid in acid phosphate	4	cents per pound.
For phosphoric acid in bone meal, basic slag and Peruvian guano	3½	cents per pound.
For nitrogen	18	cents per pound.

In Mixed Fertilizers.

For available phosphoric acid	4½	cents per pound.
For nitrogen	19½	cents per pound.
For potash	5½	cents per pound.

HOW RELATIVE VALUE IS CALCULATED.

In the calculation of relative value it is only necessary to remember that so many per cent means the same number of pounds per hundred, and that there are twenty hundred pounds in one ton (2,000 pounds).

With an 8—2—1.65 goods, which means that the fertilizer contains available phosphoric acid 8 per cent, potash 2 per cent, and nitrogen 1.65 per cent, the calculation is made as follows:

Percentage, or Lbs. in 100 Lbs.	Value Per 100 Lbs.	Value Per Ton, 2,000 Lbs.
8 pounds available phosphoric acid at 4½ cents...	0.36 ×20=	$7.20
2 pounds potash at 5½ cents.....	0.11 ×20=	2.20
1.65 pounds nitrogen at 19½ cents.....	0.321×20=	6.42
Total value	0.791×20=	$15.82

Freight and merchant's commission must be added to these prices. Freight rates from the seaboard and manufacturing centers to interior points are given in the following table:

FREIGHT RATES FROM THE SEABOARD TO INTERIOR POINTS.—From the Published Rates of the Associated Railways of Virginia and the Carolinas. In car-loads, of not less than ten tons each, per ton of 2,000 pounds. Less than car-loads, add 20 per cent.

Destination.	From Wilmington, N. C.	From Norfolk and Portsmouth, Va.	From Charleston, S. C.	From Richmond, Va.
Advance	$3.20	$3.20	$3.40	$3.20
Apex	2.70		3.80	3.00
Ashboro	3.20	3.20	3.60	3.20
Asheville	4.00	4.00	4.00	4.00
Chapel Hill	2.95	3.20	3.90	3.20
Charlotte	2.65	3.20	2.85	3.20
Clayton	2.48	2.86	3.63	2.80
Cherryville	3.85	3.60	2.40	3.63
Clinton	1.60	3.00	3.20	3.00
Creedmoor	3.00	3.00	3.80	3.00
Cunningham	3.00	2.40	4.00	2.40
Dallas	3.00	3.60	3.40	3.60
Davidson College	3.00	3.20	3.20	3.20
Dudley	1.70	3.00	3.20	3.00
Dunn	2.00	2.80	3.20	2.80
Durham	2.80	2.83	3.20	2.83
Elkin	3.60	3.20	3.60	3.20
Elm City	2.10	2.60	3.20	2.60
Fair Bluff	1.60	3.80	2.40	3.80
Fayetteville	1.80	3.00	3.00	3.00
Forestville	2.85	3.00	3.00	3.06
Gastonia	3.12	3.25	3.12	3.25
Gibson	2.10	3.50	2.10	3.50
Goldsboro	1.80	2.80	3.20	2.80
Greensboro	2.96	3.00	3.40	3.00
Hamlet	2.00	3.00	3.60	3.00
Henderson	3.00	2.83	3.55	2.83
Hickory	3.20	3.60	3.20	3.60
High Point	3.00	3.08	3.40	3.08
Hillsboro	2.88	2.88	2.68	2.88
Kernersville	3.00	3.00	3.40	3.00
Kinston	2.10	2.80	3.50	2.80
Laurel Hill	1.90	2.40	3.80	3.40
Laurinburg	1.90	3.40	3.80	3.40
Liberty	2.72	3.60	3.80	3.60
Louisburg	2.95	3.00	3.80	3.00
Lumberton	1.60	3.60	3.70	3.60
Macon	3.05	3.00	3.85	3.00
Madison	3.00	3.00	3.40	3.00
Matthews	2.60	3.20	3.20	3.20
Maxton	1.80	3.40	2.70	3.40
Milton	3.44	2.40	4.00	2.40
Mocksville	3.36	3.20	3.40	3.20
Morven	2.55	3.60	2.50	3.60
Mount Airy	2.26	3.40	3.80	3.40
Nashville	2.30	2.90	3.40	2.90
New Bern	1.25	1.75	3.95	1.75
Norwood	3.68	3.20	3.20	2.23
Oxford	3.04	2.83	3.55	2.83
Pineville	2.77	3.25	3.00	3.20
Pittsboro	2.60	3.30	4.10	3.30
Polkton	2.40	3.00	2.20	3.00
Raleigh	2.56	2.83	3.40	2.83
Reidsville	3.00	2.96	3.40	2.36
Rockingham	2.10	3.00	3.80	3.00
Rocky Mount	2.20	2.50	3.40	2.50
Ruffin	3.28	2.80	3.40	2.20
Rural Hall	3.28	3.20	3.60	3.20
Rutherfordton	3.05	3.65	3.05	3.65
Salisbury	3.25	3.20	3.20	3.20
Sanford	2.10	3.00	3.40	3.00
Selma	2.10	2.80	3.00	2.80
Shelby	2.90	3.60	3.90	3.60
Siler City	2.60	3.60	3.80	3.60
Smithfield	2.20	2.80	3.20	2.80
Statesville	3.50	3.20	3.60	3.20
Stem	2.95	2.83	3.80	2.83
Tarboro	2.30	2.40	3.00	2.40
Waco	2.90	3.60	3.40	3.60
Wadesboro	2.30	3.00	2.50	3.00
Walnut Cove	3.00	3.00	3.40	3.00
Warrenton	3.05	3.25	4.10	3.25
Warsaw	1.50	3.00	3.20	3.00
Washington	2.65	1.75	2.25	1.50
Weldon	2.55	1.90	3.85	1.90
Wilson	2.00	2.60	3.20	2.60
Winston-Salem	3.00	3.00	3.40	3.00

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1907.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	
	MIXED FERTILIZERS.											
	Brands claiming						**8.00**			**2.00**	**1.00**	**$14.90**
6276	Baugh & Sons Co., Norfolk, Va.	Baugh's Double Eagle Phosphate.	Gibsonville	R	4.38	3.59	**7.97**	.82	1.34	2.16	2.28	16.80
6207	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Guano for Wheat	Elkins	R	5.90	2.07	**7.97**	.66	1.34	2.00	2.17	16.16
6186	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s Star Brand Guano	Durham	R	5.08	2.76	**7.84**	.92	1.20	2.12	1.00	15.15
6187	----do	Travers & Co.'s Beef, Blood and Bone.	----do	R	5.45	2.59	8.04	.52	1.82	2.34	1.77	16.90
	Brand claiming						**8.00**			**2.50**	**1.50**	**17.10**
6191	Va.-Car. Chemical Co., Richmond, Va.	Durham Fertilizer Co.'s Raw Bone Superphosphate.	Wilson	S	5.60	2.57	8.17	.26	1.24	2.50	1.76	17.53
	Brands claiming						**8.00**			**2.00**	**2.00**	**16.00**
6288	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Statesville	D	2.78	2.77	**5.55**	1.18	1.58	2.76	**1.92**	16.21
6303	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Ayden	S	6.98	1.52	8.50	.92	.98	**1.90**	**1.97**	16.08
6281	Farmers Guano Co., Raleigh, N. C.	State Standard Guano	Siler City	R	4.83	2.54	**7.37**	1.10	1.50	2.60	**1.96**	17.36
6284	Listers' Agricultural Chemical Works, Newark, N. J.	Listers' Success Fertilizer	Liberty	R	5.00	3.02	8.02	1.02	1.18	2.20	2.36	17.07
6301	Navassa Guano Co., Wilmington, N. C.	Navassa Guano Fertilizer	Norwood	D	5.63	2.59	8.22	1.00	1.28	2.28	**1.94**	17.06
6286	--- do	Navassa Grain	Taylorsville	N	5.90	2.55	8.45	1.52	.90	2.42	2.36	18.18
6305	-- do	----do	Newton	R	5.45	2.35	**7.80**	.76	1.74	2.50	2.18	17.66
6300	Ober, G., & Sons Co., Baltimore, Md.	Ober's Soluble Ammoniated Superphosphate.	Albemarle	R	8.50	1.00	9.50	.88	1.28	2.16	2.23	18.13
6223	Patapsco Guano Co., Baltimore, Md.	Sea Gull	Mooresville	S	4.80	3.38	8.18	.92	1.32	2.24	2.08	17.04
6206	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Red Steer Standard Grade Guano.	Wilkesboro	R	7.15	2.05	9.20	.88	.90	**1.78**	2.14	16.50
6194	Union Guano Co., Winston, N. C.	Old Honesty Guano	Burlington	R	6.20	2.00	8.20	.64	1.36	2.00	2.16	16.35
6200	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s Anchor Brand Fertilizer.	Walnut Cove	R	4.68	3.38	8.01	1.24	1.00	2.24	2.28	17.10
6193	----do	Durham Fertilizer Co.'s Genuine Bone and Peruvian Guano.	Burlington	R	6.70	1.95	8.65	.62	1.38	2.00	**1.88**	16.45
6201	----do	Old Dominion Guano Co.'s Soluble Guano.	Winston	R	6.48	1.73	8.21	.96	1.14	2.10	2.18	16.71

6202	----do	Powers, Gibbs & Co.'s Eagle Island Ammoniated Guano.	----do	D	6.45	2.70	9.15	.62	1.30	**1.92**	2.13	16.48
6203	----do	Southern Chemical Co.'s Electric Standard Guano.	----do	R	4.28	3.94	8.22	1.08	.92	2.00	**1.94**	16.13
6291	----do	Travers & Co.'s National Fertilizer.	Statesville	R	5.40	2.82	8.22	1.38	.74	2.12	2.61	17.26
6251	----do	Travers & Co.'s National Fertilizer.	Graham	D	6.88	1.78	8.66	.78	1.58	2.36	**1.73**	17.48
	Brands claiming						**8.00**			**2.50**	**3.00**	**18.75**
6205	Patapsco Guano Co., Baltimore, Md.	Patapsco Special Tobacco Mixture.	Elkin	R	5.43	2.74	8.17	.66	1.78	**2.44**	3.61	19.37
6184	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Durham	R	7.05	1.64	8.69	1.34	1.22	2.56	**2.73**	19.27
	Brands claiming						**8.00**			**3.00**	**3.00**	**20.40**
6188	Imperial Company, Norfolk, Va.	Imperial X E O Cotton Guano	Weldon	R	6.93	2.04	8.97	1.24	1.82	3.06	3.04	21.51
6283	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont High Grade Ammoniated Bone and Potash.	Randleman	R	5.63	2.07	**7.70**	2.28	.62	**2.96**	4.06	20.96
6195	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Guano Co.'s Farmers' Friend H. G. Fertilizer.	Burlington	R	6.05	2.42	8.47	1.84	1.22	3.06	3.16	21.19
	Brands claiming						**8.00**			**4.00**	**4.00**	**24.80**
6302	Navassa Guano Co., Wilmington, N. C.	Navassa Special Truck Guano	Fayetteville	D	6.05	1.89	**7.94**	2.88	.28	**3.16**	4.20	**22.19**
6190	Va.-Car. Chemical Co., Richmond, Va.	V. C. C. Co.'s Special	Wilson	S	6.45	1.88	8.33	3.16	1.00	4.16	**3.86**	25.47
	Brand claiming						**8.50**			**2.00**	**2.00**	**16.45**
6306	Pocomoke Guano Co., Norfolk, Va.	Pocomoke Special Phosphate	Pittsboro	R	6.10	2.32	**8.42**	.72	1.50	2.22	**1.91**	17.00
	Brand claiming						**8.50**			**2.75**	**2.00**	**18.92**
6189	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s Anchor Brand Tobacco Fertilizer.	Wilson	R	6.18	2.36	8.54	1.06	1.46	**2.52**	2.09	**18.32**
	Brand claiming						**9.00**			**1.00**	**2.00**	**13.60**
6304	Va.-Car. Chemical Co., Richmond, Va.	Ford's Wheat and Corn Guano	Newton	R	6.20	1.97	**8.17**			1.74	**1.77**	15.04
	Brand claiming						**9.25**			**2.50**	**2.00**	**18.77**
6224	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Mooresville	D	5.85	4.13	9.98	1.56	1.02	2.58	2.19	19.90
	Brand claiming						**8.00**				**2.00**	**9.40**
6307	Imperial Company, Norfolk, Va.	Imperial Yadkin Wheat Grower.	Albemarle	D	7.23	1.88	9.11				**1.68**	10.04
	Brands claiming						**8.00**				**2.25**	**9.67**
6267	Union Guano Co., Winston, N. C.	Sunrise Soluble Bone and Potash	Siler City	R	3.45	4.84	8.29				**1.78**	**9.41**
6229	Va.-Car. Chemical Co., Richmond, Va.	A. & A 's McGavock's Special Potash Mixture.	Wilkesboro	R	5.53	3.13	8.66				3.27	11.39
6259	----do	A. & A.'s McGavock's Special Potash Mixture.	Burlington	D	6.88	2.36	9.24				2.07	10.59
	Brands claiming						**8.00**				**4.00**	**11.60**
6222	American Fertilizer Co., Norfolk, Va.	American Special Potash Mixture.	Charlotte	R	3.75	4.28	8.03				4.52	12.19
6224	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate with Potash.	Burlington	R	6.40	2.29	8.69				**3.60**	11.78
6208	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Elkin	R	6.20	1.81	8.01				3.80	**11.38**
6231	Va.-Car. Chemical Co., Richmond, Va.	Durham Fert. Co.'s Carr's Special Wheat Grower.	Walnut Cove	S	4.53	3.64	8.17				**2.85**	**10.48**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1907—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	
				MIXED FERTILIZERS.								
6235	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Miller's Special Wheat Mixture.	Kernersville	R	4.40	3.15	**7.55**	------	------	------	4.14	$ 11.34
6233	----do	Southern Chem. Co.'s Click's Special Wheat Compound.	Wilkesboro	R	5.30	2.78	8.08	------	------	------	4.96	12.72
	Brand claiming						**10.00**	------	------	------	**1.50**	**10.64**
6241	Va.-Car. Chemical Co., Richmond, Va.	Durham Fertilizer Co.'s Great Wheat and Corn Grower.	Burlington	R	8.03	2.07	10.10	------	------	------	1.56	10.80
	Brands claiming						**10.00**	------	------	------	**2.00**	**11.20**
6226	Armour Fertilizer Works, Wilmington, N. C.	Armour's Phosphate and Potash Works.	Winston	D	7.65	1.90	**9.55**	------	------	------	2.00	**10.79**
6273	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture.	Ashboro	R	8.20	3.26	11.46	------	------	------	**1.93**	12.43
6212	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	Hickory	S	8.53	1.16	**9.69**	------	------	------	**1.99**	**10.91**
6278	Farmers' Guano Co., Raleigh, N. C.	Century Bone and Potash Mixture.	Siler City	R	6.15	3.62	**9.77**	------	------	------	2.25	11.26
6209	Patapsco Guano Co., Baltimore, Md.	Patapsco Soluble Bone and Potash.	Siloam	R	5.55	4.60	10.15	------	------	------	**1.85**	**11.16**
6255	----do	----do	Mebane	D	5.55	4.78	10.33	------	------	------	**1.98**	11.47
6260	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Burlington	S	7.03	3.16	10.19	------	------	------	**1.50**	**10.82**
6228	Swift Fertilizer Works, Atlanta, Ga.	Standard Grade Field and Farm Phosphate and Potash.	Winston	R	8.30	1.86	10.16	------	------	------	2.27	11.64
6252	----do	Standard Grade Wheat Grower	Hillsboro	R	8.68	2.58	11.26	------	------	------	**1.84**	12.15
6289	Union Guano Co., Winston, N. C.	Union Bone and Potash	Statesville	R	7.80	2.70	10.50	------	------	------	**1.90**	11.54
6234	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s B. P Potash Mixture	Walnut Cove	R	5.80	4.08	**9.88**	------	------	------	2.20	11.31
6290	----do	Durham Fertilizer Co.'s Blue Ridge Wheat Grower.	Statesville	R	6.50	4.05	10.55	------	------	------	**1.70**	11.36
6236	----do	Old Dominion Guano Co.'s High Grade Alkaline Bone.	Winston	R	5.03	4.59	**9.62**	------	------	------	2.23	**11.11**
6239	----do	Powers, Gibbs & Co.'s Dissolved Bone and Potash.	----do	R	5.70	3.60	**9.30**	------	------	------	**1.87**	**10.42**

6237	do	Southern Chemical Co.'s Mammoth Wheat and Grass Grower.	Kernersville	R	5.78	3.97	9.75				2.03	11.00
6254	do	Southern Chemical Co.'s Winner Grain Mixture.	Mebane	R	7.75	3.05	10.80				3.50	13.57
6258	do	Travers & Co.'s Capital Bone and Potash.	Graham	D	7.95	2.56	10.51				2.18	11.85
6240	do	Winston Bone and Potash Compound.	Winston	R	4.93	4.38	9.31				1.80	10.35
	Brand claiming						10.00				3.00	12.30
6266	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Guano Co.'s Planter's Bone and Potash Mixture.	Ashboro	D	7.10	2.69	9.79				3.29	12.42
	Brands claiming						10.00				4.00	13.40
6225	Armour Fertilizer Works, Wilmington, N. C.	Armour's Superphosphate and Potash Fertilizer.	Charlotte	R	7.65	1.39	9.04				4.22	12.77
6308	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Special Caraleigh Bone and Potash Mixture.	Sanford	R	9.05	2.44	11.49				2.17	12.72
6287	Navassa Guano Co., Wilmington, N. C.	Navassa Wheat and Grass Guano.	Taylorsville	D	5.25	2.81	8.06				3.34	10.92
6260	Royster, F. S., Guano Co., Norfolk, Va	Royster's Bone and Potash Mixture.	Burlington	S	7.40	2.44	9.84				3.84	13.08
6285	Swift's Fertilizer Works, Wilmington, N. C.	High Grade Farmers' Home Phosphate and Potash.	Taylorsville	D	9.00	1.38	10.38				3.31	12.98
6272	Union Guano Co., Winston, N. C.	Quaker Grain Mixture	Ashboro	D	5.80	3.70	9.50				3.35	12.23
6257	Va.-Car. Chemical Co , Richmond, Va.	V.-C. C. Co.'s Special Potash Mixture.	Graham	D	7.88	2.51	10.39				3.91	13.65
6264	do	Va. State Fertilizer Co.'s XX Potash Mixture.	Liberty	D	7.15	2.53	9.68				3.91	13.01
	Brand claiming						10.00				5.00	14.50
6242	Va.-Car. Chemical Co., Richmond, Va.	Lynchburg Guano Co.'s Alpine Mixture.	Burlington	R	8.53	1.96	10.49				4.25	14.11
	Brand claiming						11.00				5.00	15.40
6310	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne & Sons' High Grade Bone and Potash.	Asheville	R	7.08	2.62	9.70				2.64	11.63
	Brands claiming						12.00				3.00	14.10
6270	Union Guano Co , Winston, N. C.	12-3 Bone and Potash	Liberty	R	7.88	2.37	10.25				3.78	13.38
6256	Va.-Car. Chemical Co., Richmond, Va.	Southern Chemical Co.'s Reaper Grain Application.	Graham	D	9.65	2.74	12.39				3.58	15.08
	Brand claiming						12.00				4.00	15.20
6275	Navassa Guano Co., Wilmington, N. C.	Navassa Special Wheat Mixture	Wilmington	D	8.43	2.75	11.18				3.59	14.01
	Brand claiming						12.00				5.00	16.30
6309	Va.-Car. Chemical Co., Richmond, Va.	Goodman's Special Potash Mixture.	Kernersville	R	7.40	3.84	11.24				4.29	14.83
	Brand claiming						12.00				6.00	17.40
6243	Union Guano Co., Winston, N. C.	Union 12-6 Bone and Potash	Burlington	R	9.65	2.80	12.45				5.68	17.45
	Brand claiming						7.00			3.10	3.20	18.95
6192	Va.-Car. Chemical Co., Richmond, Va.	Formula 44, Va.-Car. C. Co.'s	Wilson	R	5.45	2.93	8.38	2.62	.74	3.36	3.47	22.44

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1907—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Total Potash.	
	RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming						**10.00**					**$ 8.00**
6214	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Rural Hall	R	4.38	7.11	11.49					9.19
6215	Union Guano Co., Winston, N. C.	Union 10 Per Cent Acid Phosphate.	----do	D	5.85	4.20	10.05					8.04
	Brands claiming						**12.00**					**9.60**
6274	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Ashboro	R	10.28	2.95	13.23					10.58
6265	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Guano Co.'s Royster's High Grade Acid Phosphate.	Millboro	D	8.68	3.44	12.12					9.70
6217	----do	Powers, Gibbs & Co.'s Almont Acid Phosphate.	Winston	D	6.40	5.21	**11.61**					**9.29**
6218	----do	Travers & Co.'s Capital Dissolved S. C. Bone.	----do	D	8.43	3.38	**11.81**					**9.45**
	Brands claiming						**13.00**					**10.40**
6198	Armour Fertilizer Works, Wilmington, N. C.	Armour's 13 Per Cent Acid Phosphate.	Winston	D	11.33	1.50	**12.83**					**10.26**
6212	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade Dissolved Bone.	Elkins	D	10.75	3.42	14.17					11.33
6295	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	Troy	D	11.05	2.32	13.37					10.69
6279	Farmers' Guano Co., Raleigh, N. C.	Farmers' High Grade Acid Phosphate.	Siler City	D	11.05	2.59	13.64					10.91
6210	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade Dissolved Bone.	Elkins	D	9.58	2.54	**12.12**					**9.69**
6245	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s I X L Acid Phosphate	Durham	N	9.08	4.21	13.29					10.63
6298	--- do	Atlantic and Virginia Fert. Co.'s Crenshaw's Acid Phosphate.	Hickory	D	9.70	3.29	**12.99**					**10.39**
6249	----do	Durham Fertilizer Co.'s Double Bone Phosphate, Extra Strong.	Hillsboro	D	10.80	2.63	13.43					10.74
6293	----do	Old Dominion Guano Co.'s High Grade Bone Phosphate.	Goldsboro	D	9.50	2.70	**12.20**					**9.76**

	Brands claiming						**14.00**					**11.20**
6221	American Fertilizer Co , Norfolk, Va.	High Grade Acid Phosphate	Charlotte	N	11.73	2.35	14.08					11.26
6199	Armour Fertilizer Works, Wilmington, N. C.	Armour's Star Phosphate Fertilizer.	Winston	D	11.45	2.62	14.07					11.25
6297	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Climax Dissolved Bone	Newton	D	11.05	3.37	14.42					11.53
6296	Columbia Guano Co., Norfolk, Va.	Columbia 14 Per Cent Acid Phosphate.	Hickory	R	11.00	3.19	14.19					11.35
6294	Pocomoke Guano Co , Norfolk, Va.	Peerless Acid Phosphate	Pittsboro	R	11.35	2.72	14.07					11.25
6261	Royster, F. S., Guano Co., Norfolk, Va.	Royster's 14 Per Cent Acid Phosphate.	Hillsboro	R	10.78	3.74	14.52					11.61
6247	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Cultivator High Grade Acid Phosphate.	----do	R	12.88	1.71	14.59					11.67
6269	Union Guano Co., Winston, N. C.	Union High Grade Acid Phosphate.	Siler City	N	10.28	3.75	14.03					11.22
6246	Va.-Car. Chemical Co., Richmond, Va.	Davie & Whittle's Owl Brand Acid Phosphate.	Henderson	R	11.00	4.25	15.25					12.20
6220	----do	Durham Excelsior Dissolved Bone Phosphate.	Statesville	N	12.00	2.44	14.44					11.55
6219	----do	Southern Chemical Co.'s Red Cross Acid Phosphate.	----do	R	12.13	2.99	15.12					12.09
6262	----do	Southern Chemical Co.'s Red Cross Acid Phosphate.	Graham	D	10.60	3.62	14.22					11.38
6263	----do	V.-C. C. Co.'s 14 Per Cent Acid Phosphate.	----do	D	10.85	3.30	14.15					11.32
	Brands claiming						**16.00**					**12.80**
6213	Armour Fertilizer Works, Wilmington, N. C.	Armour's 16 Per Cent Acid Phosphate.	Winston	D	14.38	1.96	16.34					13.07
6292	Imperial Co., Norfolk, Va.	Imperial High Grade Acid Phosphate.	Windsor	R	13.85	3.06	16.91					13.52
	Brand claiming										**12.00**	**12.00**
6248	Va.-Car. Chemical Co., Richmond, Va.	Genuine German Kainit	Durham	S							12.46	12.46
	Brand claiming										**2.00**	**2.00**
6197	Lee, A. S., Sons Co., Richmond, Va.	Lee's Prepared Agricultural Lime.	Wilkesboro	R							3.28	3.28
	Brand claiming									**4.50**		*
6232	Baugh & Sons Co., Norfolk, Va.	Baugh's Raw Bone Meal	Madison	R						4.46		28.79

*Total Phosphoric Acid found, 21.38, valued at 3½ cents per pound.

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
	MIXED FERTILIZERS.															
	Brand claiming						**8.00**			**.82**	**1.00**	**1.00**				**$11.50**
6785	Powhatan Chemical Co., Richmond, Va.	Magic Corn Grower	Greensboro	S	8.50	1.88	10.38	.58	.52	1.10	1.34	1.53				15.31
	Brand claiming						**8.00**			**.82**	**1.00**	**2.00**				**12.59**
6645	Ober, G., & Sons Co., Baltimore, Md.	Ober's Farmers' Mixture	Hillsboro	R	7.45	2.32	9.77	.60	.56	1.16	1.41	2.36				15.71
	Brands claiming						**8.00**			**.82**	**1.00**	**4.00**				**14.80**
6789	Va.-Car. Chemical Co., Richmond, Va.	Virginia-Carolina Peanut Grower.	Aulander	S	4.63	3.08	**7.71**	.58	.92	1.50	1.82	**3.76**				16.92
6357	Baugh & Sons Co., Norfolk, Va.	Baugh's Excelsior Guano	Edenton	R	4.40	3.42	**7.82**	.42	.82	1.24	1.50	4.68				17.02
	Brand claiming						**8.00**			**.82**	**1.00**	**5.00**				**15.89**
6502	Martin, D. B., & Co., Richmond, Va.	Martin's Special Potato, Cotton and Peanut Guano.	Ayden	S	5.25	2.82	8.07	.78	.42	1.20	1.46	**4.21**				16.57
	Brands claiming						**8.00**			**1.65**	**2.00**	**2.00**				**15.82**
6427	American Agricultural Chemical Co., New York, N. Y.	Dawson's Crop Maker	Williamston	R	5.08	1.99	**7.07**	.87	1.52	2.39	2.90	2.51				18.44
6378	do	Lazaretto Crop Grower	Wilson	D	6.30	1.83	8.13	.78	.84	**1.62**	1.97	1.86				**15.68**
6514	do	Purity Guano	Roper	S	5.90	2.04	**7.94**	.94	.88	1.82	2.21	2.01				16.45
6804	do	Triumph Guano	Aulander	S	5.88	2.01	**7.89**	1.00	.72	1.72	2.09	2.03				16.04
6543	do	Triumph Soluble Guano	Windsor	S	5.70	2.28	**7.98**	.80	.94	1.74	2.11	2.02				16.19
6452	do	do	Williamston	S	5.50	2.42	**7.92**	1.07	.74	1.81	2.20	2.09				16.48
6431	American Fertilizer Co., Norfolk, Va.	Bone and Peruvian Guano	Elizab'h City	R	7.08	1.22	8.30	1.05	.94	1.99	2.42	**1.98**				17.29
6691	Arps, G. L., & Co., Norfolk, Va.	Arps' Big Yield Guano	Edenton	S	6.53	1.49	8.02	.92	1.06	1.98	2.40	2.17				17.32
6512	do	Arps' Premium Guano	do	S	6.70	1.59	8.29	.82	1.06	1.88	2.28	2.44				17.47
6771	Ashepoo Fertilizer Co., Charleston, S. C.	Eutaw XX Guano	Monroe	R	6.68	2.54	9.22	1.10	.86	1.96	2.38	2.33				18.50
6597	Atlantic Chemical Co., Norfolk, Va.	Atlantic Soluble Guano	Pittsboro	S	6.93	1.11	8.04	1.12	.70	1.82	2.21	**1.90**				16.42
6430	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound.	Kinston	R	7.30	1.67	8.97	.43	1.58	2.01	2.44	2.02				18.13
448	do	do	Edenton	S	5.90	1.97	**7.87**	1.05	.91	1.96	2.38	2.35				17.31
382	do	Baugh's Fish Scrap	Elizab'h City	S	6.25	2.22	8.47	.51	1.52	2.03	2.46	2.12				17.87

6809	Bragaw Fertilizer Co., Washington, N. C.	Old Reliable Premium Guano	Washington	S	5.13	2.90	8.03	.46	1.24	1.70	2.08	2.84			16.98
6677	Benton, C. J., Guano Co., Baltimore, Md.	Benton's Butcher Bone	Scotl'd Neck	R	5.93	2.06	**7.99**	1.32	.54	1.86	2.26	2.29			16.94
6524	Berkley Chemical Co., Norfolk, Va	Brandon's Superphosphate	Edenton	S	6.43	2.06	8.49	1.04	.92	1.96	2.38	**1.99**			17.47
6742	Cavaleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Guano.	Selma	R	6.05	2.55	8.60	.70	1.08	1.78	2.16	2.47			17.40
6580	do	Eli Ammoniated Fertilizer	La Grange	R	6.48	2.36	8.84	.90	.84	**1.74**		2.38			17.36
6537	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	New Bern	S	7.38	.65	8.03	1.23	.43	1.66	2.02	2.90			15.99
6770	Etiwan Fertilizer Co., Charleston, S. C.	Plow Brand Ammoniated Fertilizer.	Wadesboro	S	6.45	1.79	8.24	.90	1.10	2.00	2.43	2.50			17.96
6638	Farmers Cotton Oil Co., Wilson, N. C.	Crop King Guano	Wilson	R	5.30	2.47	**7.77**	1.48	1.30	2.78	3.37	2.16			20.21
6635	do	Farmers' Special Guano	do	R	5.50	1.25	**6.75**	.26	1.58	1.84	2.23	2.59			16.09
6631	Farmers Guano Co., Raleigh, N. C.	State Standard Guano	Clinton	R	6.07	1.58	**7.65**	.48	1.24	1.72	2.09	1.94			**15.73**
6457	Hampton Guano Co., Norfolk, Va.	Shirley Superphosphate	Elizab'h City	S	6.18	2.02	8.20	.89	.49	1.88	2.28	2.01			16.92
6380	Harrell, S. B., & Co., Norfolk, Va.	Harrell's Champion Cotton and Peanut Grower.	Edenton	S	5.65	2.50	8.15	.98	.78	1.76	2.14	2.06			16.46
6648	Hubbard's Fertilizer Co., Baltimore, Md.	Hubbard's Exchange Guano	Hillsboro	R	6.08	1.59	**7.67**	.80	1.04	1.84	2.23	3.06			17.44
6322	Imperial Co., Norfolk, Va.	Imperial Cotton Grower	Kinston	R	6.25	1.68	**7.93**	.57	1.47	2.04	2.48	2.26			17.57
6467	do	Imperial Champion Guano	Washington	S	6.68	2.01	8.69	.61	1.14	1.75	2.12	2.04			16.88
6546	do	do	Tunis	S	6.73	1.62	8.35	.78	1.14	1.92		**1.93**			17.12
6545	do	Imperial Peanut and Corn Guano.	do	R	6.60	1.56	8.16	.82	1.40	2.22		2.81			19.09
6469	do	Imperial Standard Premium Guano.	do	S	7.08	1.24	8.32	.78	1.12	1.90	2.30	2.12			17.23
6416	Meadows, E. H. & J. A., New Bern, N. C.	Meadows' Cotton Guano	Kinston	S	6.98	1.32	8.30	.35	1.30	1.65	2.00	2.20			16.32
6598	Miller Fertilizer Co., Baltimore, Md.	Ammoniated Dissolved Bone	Pittsboro	R	5.48	2.24	**7.72**	1.22	.56	1.78	2.16	2.08			16.17
6763	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton Fertilizer	Mebane	S	5.40	3.06	8.46	.90	.82	1.72	2.09	**1.75**			16.24
6661	do	Navassa Cotton-seed Meal Guano.	Rose Hill	R	5.65	2.06	**7.71**	.34	1.36	1.70	2.06	2.07			15.84
6509	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Greene County Standard Fertilizer.	Grifton	R	7.03	1.97	9.00	.30	1.78	2.08	2.53	2.39			18.90
6564	N. C Cotton Oil Co , Wilmington, N. C.	Wilmington Cotton Grower	Warsaw	D	7.33	1.66	8.99	.14	1.64	1.78	2.16	2.70			18.00
6544	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Cotton Compound	Tunis	R	8.38	.76	9.14	.90	1.06	1.96	2.38	2.34			18.44
6800	do	Ober's Standard Tobacco Fertilizer.	Burlington	R	7.70	1.49	9.19	1.22	.82	2.04	2.48	2.21	2.21	5.35	18.66
6505	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Ayden	S	5.53	2.46	**7.99**	1.04	.82	1.86	2.26	2.01			16.65
6759	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Piedmont Cultivator Brand	Burlington	S	6.80	1.49	8.29	.90	.72	**1.62**	1.98	2.39			16.40
6515	do	Piedmont Special	Williamston	S	6.43	.98	**7.41**	1.62	1.50	3.12	3.79	2.61			21.70

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
6491	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Piedmont Special for Cotton, Corn and Peanuts.	Edenton	S	6.23	1.86	8.09	.46	1.22	1.68	2.04	2.53	------	------	------	$ 16.61
6355	Pocomoke Guano Co., Norfolk, Va.	Pamlico Superphosphate	Hertford	S	6.38	1.74	8.12	.86	.92	1.78	2.16	2.05	------	------	------	16.50
6399	do	Pocomoke Superb Phosphate	Edenton	S	5.43	2.41	**7.84**	1.02	.74	1.76	2.14	2.00	------	------	------	16.12
6594	Powhatan Chemical Co., Richmond, Va.	Magic Cotton Grower	Everetts	R	6.68	1.14	**7.82**	.74	1.46	2.20	2.67	2.29	------	------	------	18.14
6325	do	do	New Bern	R	5.13	3.69	8.82	1.36	.73	2.09	2.54	2.30	------	------	------	18.61
6813	Richmond Guano Co., Richmond, Va.	Edgecombe Cotton Grower	Princeton	R	6.25	1.67	**7.92**	.24	1.12	**1.36**	1.65	2.03	------	------	------	14.66
6314	Royster, F. S., Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Greenville	R	6.63	.93	**7.56**	.63	1.20	1.83	2.22	2.39	------	------	------	16.56
6316	do	do	New Bern	S	7.30	.82	8.12	1.32	.33	1.65	2.00	2.03	------	------	------	15.97
6774	Southern Cotton Oil Co., Goldsboro, N. C.	Southern Cotton Oil Co.'s Standard.	Mount Olive	R	5.54	2.03	**7.57**	.18	1.82	2.00	2.43	2.78	------	------	------	17.67
6609	Swift Fertilizer Works, Atlanta, Ga.	Standard Grade Swift's Golden Harvest Guano.	Red Springs	R	5.97	3.28	9.25	.66	.98	**1.64**	1.99	**1.77**	------	------	------	16.66
6611	Union Guano Co., Winston, N. C.	Old Honesty Guano	do	R	6.85	1.20	8.05	.58	1.14	1.72	2.09	2.11	------	------	------	16.27
6697	Upshur, R. L., Norfolk, Va.	Upshur's Peanut Guano	Edenton	S	6.33	1.46	**7.79**	.54	1.40	1.94	2.36	2.13	------	------	------	16.92
6618	do	Upshur's Grass, Grain and Cotton Guano.	do	S	5.82	2.14	**7.96**	.68	1.30	1.98	2.40	2.18	------	------	------	17.28
6628	Va.-Car. Chemical Co., Richmond, Va.	Ajax—C. S. M.	Clinton	R	5.28	1.76	**7.04**	.12	1.64	1.76	2.14	2.07	------	------	------	15.48
6772	do	Allison & Addison's Anchor Brand Fertilizer.	Monroe	S	5.63	2.26	**7.89**	.68	1.12	1.80	2.19	2.07	------	------	------	16.40
6734	do	Allison & Addison's Old Hickory Guano	do	S	4.68	2.72	**7.40**	.98	.98	1.96	2.38	2.30	------	------	------	16.83
6788	do	Charlotte Oil and Fertilizer Co.'s King Cotton Grower.	Aulander	S	5.30	2.42	**7.72**	.32	1.74	2.06	2.50	2.31	------	------	------	17.52
6464	do	Durham Fertilizer Co.'s Genuine Bone and Peruvian Guano.	Washington	R	6.33	1.49	**7.82**	.97	.91	1.88	2.28	**1.96**	------	------	------	16.58
6623	do	Farmers' Friend Fertilizer	Rockingham	R	6.55	1.45	8.00	.50	1.40	1.90	2.31	2.06	------	------	------	16.87

6361	Va.-Car. Chemical Co., Richmond, Va.	Farmers' Favorite Fertilizer.	Lumberton	R	6.58	1.36	**7.94**	.55	1.56	2.11	2.56	**1.97**				17.54
6748	do	Lynchburg Guano Co.'s Lynchburg Soluble.	Burlington	R	5.80	2.09	**7.89**	.24	1.34	**1.58**	1.92	2.28				**15.77**
6463	do	Norfolk and Carolina Genuine Slaughterhouse Bone Guano.	Washington	R	5.68	2.32	8.00	.64	1.22	**1.86**	2.26	2.06				16.52
6446	do	Old Dominion Guano Co.'s Farmers' Friend Fertilizer.	Hertford	R	6.03	1.92	**7.95**	1.07	1.09	2.16	2.62	**1.92**				17.69
6392	do	Old Dominion Guano Co.'s Soluble Guano.	Washington	R	6.75	1.17	**7.92**	1.03	1.00	2.03	2.46	2.01				17.25
6622	do	do	Rockingham	S	5.45	1.87	**7.32**	.98	.80	1.78	2.16	**1.95**				**15.67**
6745	do	Old Dominion Guano Co.'s Soluble Tobacco Guano.	Burlington	S	5.60	2.77	8.37	.38	1.22	**1.60**	1.94	2.36	2.36		3.90	16.36
6366	do	Plant Food	Kinston	D	5.58	2.12	**7.70**	.28	1.53	1.81	2.20	2.38				16.60
6673	do	Powers, Gibbs & Co.'s Ammoniated Guano.	Robersonville	R	5.45	2.42	**7.87**	.20	1.70	1.90	2.31	**1.93**				16.61
6435	do	Powers, Gibbs & Co.'s Eagle Island Ammoniated Guano.	Elizab'h City	R	6.73	1.42	8.15	2.09	.94	3.03	3.68	2.01				21.36
6713	do	Southern Chemical Co.'s Electric Standard Guano.	Goldsboro	R	7.05	1.77	8.82	.74	.82	**1.56**	1.89	**1.94**				16.16
6708	do	Travers & Co.'s Beef, Blood and Bone Fertilizer.	Lumberton	R	6.40	1.64	8.04	.76	1.08	1.84	2.23	2.01				16.62
6542	do	do	Edenton	R	3.98	2.92	**6.90**	.96	1.12	2.08	2.53	**1.82**				16.32
6568	do	Travers' National Fertilizer	Warsaw	R	5.55	1.75	**7.30**	.66	1.10	1.76	2.14	2.02				**15.65**
6780	do	Travers' National Special Tobacco Fertilizer.	Reidsville	R	4.68	3.30	**7.98**	.56	1.22	1.78	2.16	2.07	2.07		5.90	16.40
6755	do	Virginia State Fertilizer Co.'s Battle Axe Tobacco Guano.	Burlington	R	4.70	3.64	8.34	1.12	1.28	2.40	2.91	1.77				18.81
6720	do	Wilson Standard	Edenton	R	4.78	2.92	**7.70**	.16	1.58	1.74	2.11	2.36				16.31
6696	do	Winborne's Eureka Guano	Tyner	S	4.95	2.98	**7.93**	.96	.72	1.68	2.04	2.90				16.87
6443	do	Winborne's Excelsior Guano	Edenton	S	4.90	2.80	**7.70**	1.41	.66	2.07	2.51	2.66				19.80
	Brands claiming						**8.00**			**1.65**	**2.00**	**3.00**				**16.94**
6425	Imperial Co., Norfolk, Va.	Imperial Bright Tobacco Guano.	Kinston	S	6.58	2.77	9.35	.85	1.65	2.50	3.04	3.29	3.29		6.90	21.78
6588	Pocomoke Guano Co., Norfolk, Va.	Crescent Complete Compound.	Wallace	BW	7.10	1.44	8.54	1.02	.92	1.94	2.36	2.79				18.32
6675	Richmond Guano Co., Richmond, Va.	Gilt Edge Fertilizer	Robersonville	R	5.40	1.65	**7.05**	1.60	1.28	2.88	3.50	3.36				21.27
6610	Union Guano Co., Winston, N. C.	Union Complete Cotton Mixture.	Red Springs	R	7.38	1.18	8.56	.58	1.22	1.80	2.19	2.48				17.45
	Brand claiming						**8.00**			**1.65**	**2.00**	**4.00**				**18.02**
6698	Upshur, R. L., Norfolk, Va.	Upshur's Fish, Bone and Potash.	Hertford	S	6.25	1.40	**7.65**	.50	1.32	1.82	2.21	4.54				18.98
	Brand claiming						**8.00**			**1.00**	**1.21**	**4.00**				**15.50**
6803	Martin, D. B., Co., Richmond, Va.	Martin's Abattoir Products	Aulander	S	5.38	2.52	**7.90**	.78	.46	1.24	1.51	**2.68**				**14.89**
	Brands claiming						**8.00**			**2.06**	**2.50**	**2.00**				**17.43**
6662	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eclipse Ammoniated Guano	Rose Hill	R	6.87	1.72	8.59	.94	1.18	2.12	2.57	**1.90**				18.09

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
6743	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Raleigh Special Tobacco Guano.	Selma	R	6.83	1.41	8.24	.54	1.18	**1.78**	2.16	2.23	2.23	.....	2.25	$ 16.81
6630	Farmers Guano Co., Raleigh, N. C.	Big Crop Guano	Clinton	R	7.22	1.55	8.77	.70	1.14	**1.84**	2.23	2.06	.....	.....	.....	**17.33**
6660	Navassa Guano Co., Wilmington, N. C.	Navassa Soluble Ammoniated Guano.	Wallace	R	6.02	2.32	8.34	.86	1.04	**1.90**	2.31	2.84	.....	.....	.....	18.04
	Brands claiming						**8.00**			**2.06**	**2.50**	**2.50**	.....	.....	.....	**17.98**
6639	American Fertilizing Co., Norfolk, Va.	Bob White Fertilizer for Tobacco.	Greenville	R	6.08	2.40	8.48	.82	1.14	**1.96**	.....	2.55	.....	.....	.....	18.08
6504	Pocomoke Guano Co., Norfolk, Va	Cinco Tobacco Guano	Ayden	R	5.58	2.22	7.80	.60	1.52	2.12	2.57	2.63	2.63	.....	5.30	18.18
	Brands claiming						**8.00**			**2.06**	**2.50**	**3.00**	.....	.....	.....	**18.53**
6808	Bragaw Fertilizer Co., Washington, N. C.	Tuckahoe Tobacco Guano	Washington	R	6.53	1.42	**7.95**	.66	1.34	**2.00**	2.43	**2.93**	2.93	.....	3.80	**18.18**
6672	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Special Tobacco Guano.	Maxton	R	7.85	1.29	9.14	1.12	.58	**1.70**	2.06	**2.28**	2.28	.....	2.15	**17.36**
6711	---do	Planters' Pride	Lumberton	R	6.63	1.29	**7.92**	.72	1.22	**1.94**	2.36	**2.90**	.....	.....	.....	**17.88**
6331	Craven Chemical Co., New Bern, N. C.	Marvel Great Crop Grower	New Bern	R	5.60	2.20	**7.80**	.84	1.20	**2.04**	2.48	2.97	.....	.....	.....	**18.24**
6787	Farmers Cotton Oil Co., Wilson, N. C.	Planters' Friend Guano	Aulander	R	6.58	1.29	**7.87**	.32	1.70	**2.02**	2.45	3.17	.....	.....	.....	**18.45**
6577	Meadows, E. H. & J. A., New Bern, N. C.	Meadows' All Crop Guano	La Grange	S	6.35	2.12	8.47	.68	1.26	**1.94**	2.36	2.75	.....	.....	.....	**18.21**
6576	---do	Meadows' Roanoke Guano	---do	R	8.50	1.32	9.82	.68	1.34	**2.02**	2.45	2.55	.....	.....	.....	19.52
6477	Pamlico Chemical Co., Washington, N. C.	Farmers' Best Guano	Washington	R	5.68	2.20	**7.88**	.61	1.53	2.14	2.60	3.26	.....	.....	.....	19.02
6791	Patapsco Guano Co., Baltimore, Md.	Unicorn Guano	Neals	R	5.55	2.25	**7.80**	1.08	1.00	2.08	2.53	**2.76**	.....	.....	.....	**18.17**
6776	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Guano for All Crops.	Mount Olive	S	6.30	1.64	**7.94**	.98	1.14	2.12	2.57	3.48	.....	.....	.....	19.22
6794	---do	Piedmont Guano for Tobacco	Burlington	R	2.60	5.43	8.03	1.00	1.16	2.16	2.62	3.78	3.78	.....	9.25	19.81
6574	Powhatan Chemical Co., Richmond, Va.	King Brand High Grade Fertilizer.	Wilson	R	6.68	1.57	8.25	1.00	1.20	2.20	2.67	3.24	.....	.....	.....	19.56
6324	---do	White Leaf High Grade Tobacco Fertilizer.	New Bern	R	3.70	4.37	8.07	1.72	.82	2.54	3.08	3.26	3.26	.....	5.97	20.65

6480	Roberson, J. H., & Co., Robersonville, N. C.	Roberson's Bright Leaf Grower.	Robersonville	R	4.55	3.24	**7.79**	.82	1.37	2.19	2.66	3.41	3.44	----	3.05	19.53
6317	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	New Bern	S	7.30	1.02	8.32	.82	1.34	2.16	2.62	3.03	3.03		7.15	19.24
6752	Union Guano Co., Winston, N. C.	Union Waterfowl Guano	Haw River	R	5.55	1.88	**7.43**	.32	1.82	2.14	2.60	4.49	----		----	19.97
6540	Va.-Car. Chemical Co., Richmond, Va.	Blue Star	Edenton	R	6.03	1.80	**7.83**	.76	1.36	2.12	2.57	3.38				19.03
6563	do	Carolina Golden Belt Guano for Tobacco.	Robersonville	R	5.43	2.51	**7.94**	.50	1.58	2.08	2.53	3.94	3.94	----	6.20	19.59
6570	do	Durham Fertilizer Co.'s N. C. Farmers' Alliance Guano.	Magnolia	R	6.18	2.31	8.49	.98	1.10	2.08	2.53	3.05	----	----	----	19.10
6539	do	do	Washington	R	6.65	1.35	8.00	.78	1.46	2.24	2.72	**2.77**	----	----	----	18.98
6444	do	Powers, Gibbs & Co.'s Carolina Golden Belt Ammoniated Guano for Tobacco.	Robersonville	D	6.13	1.68	**7.81**	.69	1.83	2.52	3.06	3.06	3.06	----	2.95	20.22
6569	do	do	Magnolia	S	4.68	1.89	**6.57**	1.10	.96	2.06	2.50	3.05	3.05	----	2.90	17.30
6688	do	Southern Chemical Co.'s Pilot Ammoniated Guano, Special for Tobacco.	Pembroke	R	6.65	1.16	**7.81**	.86	1.20	2.06	2.50	2.63	2.63	----	3.35	17.95
6566	do	Superlative Guano	Warsaw	R	6.33	1.76	8.09	.54	1.62	2.16	2.62	2.89	----	----	----	18.88
6649	do	Tinsley & Co.'s Killikinnick Tobacco Mixture.	Washington	R	6.38	1.40	**7.78**	.54	1.52	2.06	2.50	**2.75**	**2.75**	----	3.70	**18.06**
	Brands claiming						**8.00**			**2.27**	**2.75**	**2.00**				**18.25**
6513	Camp, W. H., Manufacturing Co., Petersburg, Va.	Red Head Camp's Prepared Chemicals.	Elizab'h City	R	5.98	2.31	8.29	2.18	.60	2.78	3.37	2.11	----	----	----	20.62
6792	Farmers Cotton Oil Co., Wilson, N. C.	Wilson's High Grade Guano	Aulander	R	5.45	1.01	**6.46**	.92	1.48	2.40	2.91	2.36	----	----	----	**17.77**
6421	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Winston	R	6.58	1.46	8.04	.60	1.56	2.16	2.62	2.01	----	----	----	**17.87**
6478	Pamlico Chemical Co., Washington, N. C.	Staton & Taylor's Special Corn Grower.	Washington	R	6.33	1.73	8.06	.83	1.48	2.31	2.80	2.91	----	----	----	19.46
6689	Va.-Car. Chemical Co., Richmond, Va.	Royal Crown	Rowland	R	7.23	.82	8.05	.50	1.50	**2.00**	2.43	2.06	----	----	----	**17.31**
	Brand claiming						**8.00**			**2.27**		**2.50**				**18.80**
6773	Southern Cotton Oil Co., Goldsboro, N. C.	Southern Cotton Oil Co.'s High Grade Guano.	Mt. Olive	R	5.41	2.16	**7.57**	.72	1.80	2.52	3.06	3.50	----	----	----	20.49
	Brands claiming						**8.00**			**2.47**	**3.00**	**2.00**				**19.03**
6449	Home Fertilizer Chemical Co., Baltimore, Md.	Phœnix Crop Grower	Greenville	R	6.50	1.54	8.04	.63	2.07	2.70	3.28	2.61	----	----	----	20.63
6659	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton-seed Meal Guano.	Rose Hill	R	5.55	1.92	**7.47**	.78	1.58	**2.36**	2.87	2.68	----	----	----	**18.21**
6584	do	Navassa Cotton-seed Meal Special 3 Per Cent Guano.	Laurinburg	R	5.38	1.61	**6.99**	.92	1.54	**2.46**	2.99	2.25	----	----	----	**18.36**
6709	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co.'s Cotton Belt Ammoniated Guano.	Rowland	R	6.93	1.16	8.09	.76	1.54	**2.30**	2.79	**1.80**	----	----	----	**18.23**
6368	do	Charlotte Oil and Fert. Co.'s Special 3 Per Cent. Guano.	Lumberton	D	6.30	1.35	**7.65**	.85	1.88	2.73	3.32	2.25	----	----	----	20.00

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
	Brands claiming						**8.00**			**2.47**	**3.00**	**2.50**				**$19.58**
6360	Acme Manufacturing Co., Wilmington, N. C.	Acme Fertilizer	Lumberton	R	6.60	1.59	8.19	1.04	1.55	2.59	3.14	2.52				20.24
6347	----do	Acme Fertilizer for Tobacco	Robersonville	R	7.03	1.87	8.90	1.00	1.47	2.47	3.00	2.78	2.78		5.60	20.70
	Brand claiming						**8.00**			**2.47**	**3.00**	**2.50**				**10.58**
6657	Va.-Car. Chemical Co., Richmond, Va.	Split Silk	Clinton	R	6.37	1.05	**7.42**	.78	1.70	2.48	3.01	2.70				**19.32**
	Brands claiming						**8.00**			**2.47**	**3.00**	**3.00**				**20.13**
6348	American Agricultural Chemical Co., New York, N. Y.	Lazaretto Special for Tobacco and Potatoes.	Edenton	R	6.48	1.87	8.35	.55	1.91	**2.46**	2.99	3.14	3.14		6.65	20.56
6396	American Fertilizing Co., Norfolk, Va.	American Eagle Guano	----do	R	5.53	1.24	**6.77**	1.55	1.73	3.28	3.98	3.68				21.83
6363	Armour Fertilizer Works, Wilmington, N. C.	Armour Cotton Special Fertilizer.	Lumberton	R	6.65	1.37	8.02	2.08	1.02	3.10	3.76	3.65				23.32
6739	Atlantic Chemical Co., Norfolk, Va.	Atlantic High Grade Cotton Guano.	Waxhaw	S	7.65	.60	8.25	1.50	.94	**2.44**	2.96	**2.85**				**20.07**
6384	Baugh & Sons Co., Norfolk, Va.	Baugh's Grand Rapid High Grade Truck Guano.	Elizab'h City	R	6.70	1.45	8.15	1.30	1.14	**2.44**	2.96	3.25				20.42
6419	----do	Baugh's High Grade Tobacco Guano.	Kinston	R	6.90	1.41	8.31	1.23	1.27	2.50	3.04	3.40	3.40		6.85	20.96
6509	----do	Baugh's High Grade Truck Guano.	Williamston	R	5.48	3.26	8.74	.38	2.38	2.76	3.35	3.36				22.32
6470	Bragaw, Wm., & Co., Washington, N. C.	Beaufort County Guano	Washington	S	5.35	2.79	8.14	.60	1.15	**1.75**	2.12	**2.96**				**17.41**
6455	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne's Best	Greenville	R	5.90	1.65	**7.55**	.36	2.29	2.65	3.22	3.17				**19.21**
6707	Clayton Oil Mills, Clayton, N. C.	Clayton Guano	Selma	R	5.98	1.76	**7.74**	.76	1.76	2.52	3.06	3.12				20.22
6326	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	New Bern	S	7.50	.76	8.26	1.64	.77	**2.41**	2.93	2.99	2.99		7.00	**20.06**
6349	do	Olympia Cotton Guano	Edenton	R	6.95	1.04	**7.99**	1.30	1.35	2.68	3.22	3.35				21.20
6397	Cowell, Swan & McCotter Co., Bayboro, N. C.	Cowell's Great Tobacco Grower.	Washington	R	4.70	3.10	**7.80**	1.22	1.56	2.78	3.37	3.01	.40	2.61	.30	21.17

6632	Craven Chemical Co., New Bern, N. C.	Foy's High Grade Guano	Mt. Olive	R	2.80	4.45	**7.25**	.60	1.58	**2.18**	2.65	**2.89**				**18.20**
6636	Farmers Cotton Oil Co., Wilson, N. C.	Graves' Cotton Grower Guano	Wilson	R	6.38	1.64	8.02	.72	1.52	**2.24**	2.72	3.51				**19.81**
6656	do	Golden Gem Guano	Aulander	R	6.05	1.68	**7.73**	.24	2.52	2.76	3.35	**2.69**				20.67
6634	Farmers Guano Co., Raleigh, N C.	Golden Grade Guano	Wilson	R	6.60	1.07	**7.69**	.78	1.86	2.64	3.20	3.10				**20.00**
6503	Hampton Guano Co., Norfolk, Va.	Hampton Tobacco Guano	Ayden	S	5.93	2.11	8.04	.36	1.04	**2.40**	2.91	3.24	3.24		7.42	**20.16**
6684	Hubbard Fertilizer Co., Baltimore, Md.	Hubbard's Yellow Wrapper Guano.	Scotl'd Neck	S	3.48	3.22	**6.70**	1.68	.98	2.66	3.23	3.57	3.57		9.00	20.33
6465	Imperial Co., Norfolk, Va.	Imperial Tobacco Guano	Washington	R	6.78	1.16	**7.94**	1.22	1.17	**2.39**	2.90	3.07	3.07		7.80	**19.84**
6466	do	Imperial X-L-O Cotton Guano.	Washington	S	6.80	1.20	8.00	1.28	1.12	**2.40**	2.91	3.16				**20.03**
6411	Martin, D. B., Co , Richmond, Va.	Martin's Bull Head Fertilizer.	New Bern	R	6.65	1.93	8.58	2.24	.48	2.72	3.30	**2.84**				21.45
6438	do	Martin's Bull Head Fertilizer for Cotton and Tobacco.	Edenton	S	6.23	1.92	8.15	1.85	.72	2.57	3.12	**2.57**	0.2	2.37	0.15	20.18
6415	Meadows, E. H. & J. A., New Bern, N. C.	Meadows' Gold Leaf Tobacco Guano.	Kinston	R	7.70	1.15	8.85	.78	1.81	2.59	3.14	**2.83**	2.83		3.00	21.17
6681	Miller Fertilizer Co., Baltimore, Md.	Standard Phosphate	Scotl'd Neck	S	5.88	2.04	**7.92**	1.46	1.28	2.74	3.33	**2.84**				20.93
6507	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Pitt's Prolific Golden Tobacco Grower.	Ayden	R	6.70	1.44	8.14	.86	1.96	2.82	3.42	3.49	.84	2.65	.63	22.16
6669	N. C. Cotton Oil Co., Wilmington, N. C.	Carter's Lifter	Maxton	R	6.92	1.80	8.72	.76	1.68	**2.44**	2.96	3.76				21.50
6565	do	Wilmington High Grade	Warsaw	R	7.23	1.43	8.66	.68	1.66	**2.34**	2.84	3.60				20.88
6619	Norfolk Fertilizer Co., Norfolk, Va.	Oriana Tobacco Guano	Washington	S	6.77	1.58	8.35	.70	1.16	**1.86**	2.26	**2.48**	2.48		6.60	**17.50**
6476	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Compound for Tobacco.	Greenville	R	7.65	.85	8.50	1.61	.86	2.47	3.00	3.40	3.40		5.25	21.02
6644	do	do	Durham	R	7.63	1.10	8.73	1.64	.86	2.50	3.04	3.21	3.21		5.10	21.13
6436	Pamlico Chemical Co., Washington, N. C.	Farmers' Best Friend	Washington	R	6.75	2.22	8.97	2.06	.49	2.55	3.10	3.09				21.41
6394	do	Tobacco Growers' Friend	do	R	6.60	2.14	8.74	1.22	1.35	2.57	3.12	3.14	0.27	2.87	0.20	21.34
6472	Patapsco Guano Co., Baltimore, Md.	Choctaw Guano	Greenville	S	6.30	2.12	8.42	1.78	1.02	2.80	3.40	**2.75**				21.52
6798	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Levering's Reliable Tobacco Guano.	Burlington	R	6.48	1.68	8.16	1.30	1.18	2.48	3.01	3.24	3.24		7.25	20.56
6526	do	Piedmont High Grade Ammoniated Bone and Potash.	Edenton	R	6.60	1.55	8.15	1.02	1.56	2.58	3.13	3.37				21.10
6738	Pocomoke Guano Co., Norfolk, Va.	Harvey's High Grade Monarch.	Monroe	S	5.98	1.97	**7.95**	1.56	1.04	2.60	3.16	3.06				20.66
6423	Powhatan Chemical Co., Richmond, Va.	High Grade Hustler	Kinston	R	6.55	1.67	8.22	1.32	1.32	2.64	3.20	**2.78**				20.75
6737	Rasin-Monumental Co., Baltimore, Md.	Rasin's Gold Standard	Waxhaw	S	6.53	1.44	**7.97**	1.42	1.22	2.64	3.20	3.00				20.76
6372	Richmond Guano Co., Richmond, Va.	Gilt Edge High Grade Fertilizer.	Edenton	R	6.40	1.70	8.10	1.50	1.38	2.88	3.50	3.06				21.99

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
6318	Royster, F. S., Guano Co., Norfolk, Va.	Bonanza Tobacco Guano	New Bern	S	6.75	.93	**7.68**	1.51	.71	**2.22**	2.70	3.16	3.16	-----	8.00	**$ 19.05**
6766	Southern Exchange Co, Maxton, N. C.	Correct Cotton Compound	Maxton	S	6.62	1.44	8.06	1.40	1.04	**2.44**	2.96	3.06	-----	-----	-----	20.14
6667	---do	Jack's Best Fertilizer	---do	S	7.60	1.11	8.71	1.66	.76	**2.42**	2.94	**2.97**	-----	-----	-----	20.54
6708	---do	R. M. C. Special Crop Grower	Parkton	S	7.32	1.12	8.44	1.72	.72	**2.44**	2.96	**2.98**	-----	----	-----	20.39
6529	Swift Fertilizer Works, Wilmington, N. C.	Swift's Ruralist High Grade Guano.	Chadbourn	R	6.08	1.54	**7.62**	.80	2.20	3.00	3.64	3.36	-----	-----	-----	22.25
6459	---do	---do	Greenville	R	7.33	1.79	9.12	.59	2.38	2.97	3.60	4.05	-----	-----	-----	24.24
6666	Union Guano Co, Winston, N. C.	Union Homestead Guano	Wadesboro	R	6.98	1.74	8.72	1.00	1.60	2.60	3.16	3.20	-----	-----	-----	21.50
6753	---do	Victoria High Grade Tobacco Fertilizer.	Haw River	D	6.40	1.84	8.24	.72	1.42	**2.14**	2.60	**2.70**	2.70	-----	4.95	**18.73**
6722	Upshur, R. L., Norfolk, Va.	Upshur's 3-8-3 Cotton Guano	Elizab'h City	S	6.30	1.44	**7.74**	1.36	1.28	2.64	3.20	3.42	-----	-----	-----	21.02
6422	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's A. A. Guano.	Kinston	R	5.58	2.07	**7.65**	2.62	.38	3.00	3.64	3.11	-----	-----	-----	22.00
6741	---do	Blake's Best Guano	Selma	S	6.25	2.08	8.33	.82	1.64	**2.46**	2.99	3.03	-----	-----	-----	20.42
6686	---do	Davie & Whittle's Owl Brand Guano for Tobacco.	Washington	D	6.70	.98	**7.68**	1.01	1.84	2.85	3.46	**2.65**	2.65	-----	2.95	20.94
6391	---do	Durham Fertilizer Co.'s Golden Leaf Bright Tobacco Guano.	---do	R	6.83	.93	**7.76**	1.07	1.37	**2.44**	2.96	3.27	3.27	-----	3.40	20.14
6330	---do	Norfolk and Carolina Amazon High Grade Manure.	New Bern	R	5.45	2.07	**7.52**	.94	1.40	**2.34**	2.84	4.32	-----	-----	-----	20.64
6278	---do	Norfolk and Carolina Bright Leaf Tobacco Grower.	Washington	R	5.20	2.32	**7.52**	1.02	1.60	2.62	3.18	3.06	3.06	-----	2.65	20.35
6279	---do	Old Dominion Co.'s Farmers' Friend Special Tobacco Fertilizer.	Edenton	R	6.68	1.33	8.01	1.03	1.57	2.60	3.16	3.72	2.72	1.00	2.05	21.44

6462	do	Powers, Gibbs & Co.'s Old Kentucky High Grade Tobacco Manure.	Washington	R	5.90	1.31	**7.21**	2.21	2.24	4.45	5.40	**2.85**	2.85		2.50	20.98
6328	do	Va.-Car. Chemical Co.'s Farmers' Friend High Grade Guano.	New Bern	R	5.93	1.65	**7.58**	1.05	1.80	2.85	3.46	3.85				27.21
6687	do	Virginia State Fertilizer Co.'s Bull Dog Soluble Guano.	Rowland	R	6.43	1.42	**7.85**	.82	1.70	2.52	3.06	**2.83**				**20.00**
6442	Winborne Guano Co., Tyner, N. C.	Winborne's King Farming Guano.	Edenton	R	4.08	2.96	**7.04**	2.16	.46	2.72	3.30	5.75				23.26
6538	do	Winborne's Tobacco Guano	do	R	4.90	2.47	**7.37**	1.32	1.52	2.84	3.45	**3.68**	3.68		6.35	21.75
	Brands claiming						**8.00**			**2.47**	**3.00**	**4.00**				**21.23**
6653	Meadows, E. H. & J. A., New Bern, N. C.	Parker's Special Tobacco Guano.	Greenville	S	6.01	1.99	8.00	1.30	1.38	2.68	3.25	4.11	4.11		4.40	22.56
6700	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Privott's 3-8-4 Guano	Edenton	R	6.85	1.64	8.49	1.24	1.08	**2.32**	2.82	**3.64**				**20.69**
6365	Southern Exchange Co., Maxton, N. C.	Bull of the Woods Fertilizer	Lumberton	R	6.50	1.90	8.40	1.53	.79	**2.32**	2.82	**3.79**				**20.77**
6369	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Oil and Fertilizer Co.'s Groom's Special Tobacco Fertilizer.	do	R	6.13	1.72	**7.85**	1.07	1.47	2.54	3.08	**3.68**	3.68		5.00	**21.01**
6567	do	Va.-Car. Chemical Co.'s Lion High Grade Fertilizer.	Warsaw	R	6.13	1.57	**7.70**	2.00	.88	2.88	3.50	**3.93**	3.93		3.15	22.48
6716	do	Va.-Car. Chemical Co.'s Lion High Grade Tobacco Fertilizer.	Goldsboro	R	5.88	1.65	**7.53**	1.22	1.42	2.64	3.20	**3.57**				**21.00**
	Brand claiming						**8.00**			**2.47**	**3.00**	**5.00**				**22.33**
6506	Patapsco Guano Co., Baltimore, Md.	Patapsco Plant Food for Tobacco, Cotton and Truck.	Grifton	S	5.03	2.92	**7.95**	1.76	.68	**2.44**	2.96	5.20	5.20		6.75	22.39
	Brand claiming						**8.00**			**2.47**	**3.00**	**10.00**				**27.83**
6555	Baugh & Sons Co., Norfolk, Va.	Baugh's Fruit and Berry Guano.	Wilmington	D	7.20	.98	8.18	1.34	1.42	2.76	3.35	**9.63**				28.70
	Brand claiming						**8.00**			**3.30**	**4.00**	**3.00**				**23.37**
6387	Va.-Car. Chemical Co., Richmond, Va.	Travers & Co.'s Capital Tobacco Fertilizer.	Wilmington	R	6.60	1.26	**7.86**	2.89	.51	3.40	4.13	3.08	3.08		4.90	23.72
	Brands claiming						**8.00**			**3.30**	**4.00**	**4.00**				**24.47**
6420	Acme Mfg. Co., Wilmington, N. C.	Quick Step Fertilizer	Kinston	R	6.73	1.34	8.07	.81	1.48	**3.29**	4.00	**3.90**				**24.38**
6443	Armour Fertilizer Works, Wilmington, N. C.	Armour's Special Trucker Fertilizer.	do	R	5.20	1.77	**6.97**	2.47	.50	3.97	4.82	5.12				27.38
6554	Baugh & Sons Co., Norfolk, Va.	Baugh's Fish, Bone and Potash.	Chadbourn	R	6.65	1.78	8.43	1.60	1.64	**3.24**	3.93	4.33				24.98
6786	Columbia Guano Co., Norfolk, Va.	Columbia Special Truck Guano.	Greensboro	R	6.40	1.15	**7.55**	2.44	1.34	3.78	4.59	**3.99**				25.92
6777	Craven Chemical Co., New Bern, N. C.	Hanover Standard Guano	Mt. Olive	R	6.45	.52	**7.97**	1.84	1.44	**3.28**	3.98	**3.92**				**24.28**
6793	Columbia Guano Co., Norfolk, Va.	Pelican Ammoniated Guano	Charlotte	R	5.75	2.22	**7.97**	1.58	1.76	3.34	4.05	**3.93**				24.52
6321	Imperial Co., Norfolk, Va.	Snow Flake Cotton Grower	Kinston	S	6.95	1.15	8.10	.66	1.37	**2.03**	2.46	**3.87**				**19.46**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
6533	Martin, D. B., Co., Richmond, Va.	Martin's Red Star	Elizab'h City	S	6.53	1.52	8.05	2.78	.88	3.66	4.44	4.06	------	------	------	$ 25.98
6450	Miller Fertilizer Co., Baltimore, Md.	Miller's Irish Potato	----do	R	4.70	2.29	**6.99**	1.96	1.75	3.71	4.50	4.14	------	------	------	25.31
6692	----do	----do	Maxton	R	5.83	1.56	**7.39**	1.70	1.72	3.42	4.15	4.37	------	------	------	24.79
6583	Navassa Guano Co., Wilmington, N. C.	Navassa Special Truck Guano.	Laurinburg	R	5.68	1.86	**7.54**	2.28	1.64	3.92	4.76	**3.31**	------	------	------	25.71
6508	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Oriole Tobacco Grower	Ayden	R	7.05	1.39	8.44	1.84	2.04	3.88	4.71	4.58	1.47	3.11	1.10	27.76
6424	Powhatan Chemical Co., Richmond, Va.	High Grade North State Special.	Kinston	R	6.83	1.66	8.49	2.31	1.17	3.48	4.22	4.08	------	------	------	25.46
6315	Royster, F. S., Guano Co., Norfolk, Va.	Truckers' Delight	Hertford	R	6.88	.92	**7.80**	2.57	1.47	4.04	4.90	**3.94**	------	------	------	27.10
6530	Swift Fertilizer Works, Wilmington, N. C.	Swift's High Grade Monarch Vegetable Grower	Chadbourn	R	6.38	1.79	8.17	.56	2.68	**3.24**	3.93	**3.78**	------	------	------	**24.14**
6715	Va.-Car. Chemical Co., Richmond, Va.	Carr's 8-4-4 Crop Grower	Goldsboro	S	7.10	1.32	8.42	1.90	1.14	**3.04**	3.69	**3.77**	------	------	------	**23.58**
6735	---do	Carr's Crop Grower	Waxhaw	S	6.75	1.17	**7.92**	2.20	1.18	3.38	4.10	4.53	------	------	------	25.29
6805	---do	Powers, Gibbs & Co.'s Cotton Brand Ammoniated Bone.	Pineville	R	5.35	2.41	**7.76**	.99	2.25	**3.24**	3.93	**3.77**	------	------	------	**23.77**
	Brand claiming						**8.00**			**3.30**	**4.00**	**5.00**				**25.57**
6434	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co.'s Truck Farmers' Special Ammoniated Guano.	Elizab'h City	R	7.18	1.31	8.49	2.40	.78	**3.18**	3.86	5.19	------	------	------	25.75
	Brands claiming						**8.00**			**3.30**	**4.00**	**6.00**				**26.67**
6556	Baugh & Sons Co., Norfolk, Va.	Baugh's Special Guano	Wilmington	R	6.65	1.76	8.41	1.86	1.58	3.44	4.18	6.27	------	------	------	27.88
6693	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Superior Cotton Fertilizer.	Rowland	R	8.15	1.27	9.42	2.02	1.60	3.62	4 39	6.33	------	------	------	29.55
	Brands claiming						**8.00**			**3.70**	**4.50**	**7.00**				**29.33**
6637	Farmers Cotton Oil Co., Wilson, N. C.	Dean's Special Guano	Wilson	R	7.05	1.22	8.27	1.08	2.68	3.76	4.56	7.19	------	------	------	30.01
6623	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Best Guano	----do	S	4.85	3.19	8.04	2.34	1.58	3.92	4.76	**6.53**	------	------	------	29.71

	Brand claiming						8.00			2.87	3.50	7.50					26 64
6516	Camp, W. H., Petersburg, Va.	Yellow Head Camp's Prepared Chemicals.	Edenton	R	7.25	1.92	9.17	2.80	.48	3.28	3.98	7.02					30.97
	Brand claiming						8.00			4.12	5.00	3.00					26 56
6541	Va.-Car. Chemical Co., Richmond, Va.	Durham Fertilizer Co.'s Special Plant and Truck Fertilizer.	Belcross	R	6.03	1.22	7.25	2.06	1.84	3.90	4.73	3.67					25.77
	Brands claiming						8.00			4.12	5.00	5.00					28.77
6511	Meadows, E. H. & J. A., New Bern, N. C.	Meadows' Labos Guano	Grifton	R	4.58	3.07	7.65	2.44	1.60	4.06	4.93	5.40					28.66
6528	Va.-Car. Chemical Co., Richmond, Va.	Norfolk and Car. Chemical Co.'s Norfolk Truck and Tomato Grower.	Edenton	R	4.58	2.22	6.80	2.86	2.02	4.88	5.92	4.98					30.63
6527	----do	Atlantic and Va. Fertilizer Co.'s Virginia Trucker.	Elizab'h City	R	5.68	1.87	7.55	2.22	2.16	4.38	5.32	5.12					29.50
	Brands claiming						8.00			4.12	5.00	7.00					30.97
6352	Armour Fertilizer Works, Baltimore, Md.	Bone, Blood and Potash	Elizab'h City	S	5.78	2.61	8.39	2.75	1.86	4.61	5.60	7.04					33.26
6323	Pamlico Chemical Co., Washington, N. C.	Cowell's Great Potato Grower.	Beaufort	R	6.38	1.61	7.99	1.33	2.57	3.90	4.73	6.42					29.46
6607	Southern Exchange Co., Maxton, N. C.	McKinnon's Special Truck Formula.	Parkton	R	6.82	1.65	8.47	3.06	.96	4.02	4.88	7.08					31.08
	Brand claiming						8.50			1.65	2.00	1.50					15.74
6490	American Fertilizing Co., Norfolk, Va.	Peruvian Mixture	Edenton	R	4.08	2.97	7.05	.74	1.14	1.88		1.50					15.33
	Brand claiming						9.00			.82	1.00	3.00					14.59
6475	Patapsco Guano Co., Baltimore, Md.	Coon Brand Guano	Greenville	S	6.45	2.22	8.67	.63	.51	1.14	1.38	2.85					15.38
	Brands claiming						9.00			1.65	2.00	1.00					15.64
6441	Va.-Car. Chemical Co., Richmond, Va.	A. and A.'s Star Brand Guano.	Durham	R	6.10	2.62	8.72	.40	1.20	1.60	1.94	1.07					15.26
6795	----do	Va. State Fertilizer Co.'s Highland King.	Burlington	R	4.60	3.68	8.28	1.22	1.14	2.36	2.87	1.75					18.58
	Brands claiming						9.00			1.65	2.00	2.00					16.73
6388	American Agricultural Chemical Co., New York, N. Y.	Gold Dust Guano	Edenton	S	7.00	1.76	8.76	.99	.82	1.81	2.20	2.09					16.26
6806	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Concord	R	7.98	1.07	9.05	.96	.92	1.88	2.28	2.19					17.88
	Brand claiming						9.00			1.85	2.25	1.00					16.41
6362	Bradley Fertilizer Co., Boston, Mass.	Sea Fowl Standard Guano	Lumberton	D	5.35	3.70	9.05	.91	1.17	2.08	2.52	1.25					17.63
	Brand claiming						9.00			1.65	2.00	4.00					18.93
6522	Berkley Chemical Co, Norfolk, Va.	Monitor Animal Bone Fertilizer.	Edenton	R	6.10	2.60	8.70	1.20	.74	1.94	2.36	3.96					19.75
	Brands claiming						9.00			2.27	2.75	2.00					19.16
6579	Acme Manufacturing Co., Wilmington, N. C.	Acme Cotton Grower	La Grange	R	7.45	1.71	9.16	.90	1.34	2.28	2.77	1.96					19.29
6482	Bragaw Fertilizer Co., Washington, N. C.	Farmers' Union Meal Mixture.	Washington	R	6.33	2.54	8.87	.46	1.81	2.27	2.75	1.97					19.00

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
MIXED FERTILIZERS.																
6593	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Pacific Tobacco and Cotton Grower.	Robersonville	R	7.88	.63	**8.51**	.10	2.12	2.22	2.70	2.15	------	------	------	**$18.68**
6560	Columbia Guano Co., Norfolk, Va.	Columbia C. S. M., Special	----do	S	8.03	.79	**8.82**	.82	1.52	2.34	2.84	2.34	------	------	------	19.64
6668	MacMurphy Co., Charleston, S. C.	Wilcox, Gibbs & Co.'s Manipulated Guano.	Maxton	S	8.15	1.27	9.42	.76	1.62	2.38	2.89	2.43	------	------	------	20.43
6537	Pamlico Chemical Co., Washington, N. C.	Prosperity Cotton Grower	Washington	R	7.38	1.72	9.10	1.04	1.28	2.32	2.82	2.55	------	------	------	20.04
6575	Powhatan Chemical Co., Richmond, Va.	High Grade Economic Cotton Grower.	Wilson	R	8.88	.66	9.54	.20	1.68	1.88	2.28	2.34	------	------	------	**18.49**
6562	Richmond Guano Co., Richmond, Va.	Carolina Cotton Grower	Robersonville	D	8.38	1.48	9.86	.40	1.84	2.24	2.72	1.97	------	------	------	19.77
6558	Royster, F. S.. Guano Co., Norfolk, Va.	Royster's Meal Mixture	Wilmington	R	8.00	1.50	9.50	1.00	1.36	2.36	2.87	3.63	------	------	------	21.74
6718	Southern Cotton Oil Co., Goldsboro, N. C.	Best & Thompson's Special Cotton Grower.	Goldsboro	R	6.68	2.35	9.03	.52	1.78	2.30	2.79	2.46	------	------	------	19.80
6495	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Special Tobacco Mixture.	Edenton	N	6.50	2.26	**8.76**	.63	1.86	2.49	3.02	**1.87**	1.87	------	1.40	19.65
6678	----do	----do	Hobgood	R	7.35	1.31	**8.66**	.76	1.90	2.66	3.23	2.64	2.64	-----	2.20	21.07
6674	----do	Carolina Cotton Grower	Robersonville	D	6.42	2.78	9.20	.18	2.08	2.26	2.75	2.19	-----	----	------	19.50
6447	----do	Prolific Cotton Grower	Edenton	D	6.08	1.69	**7.77**	1.04	2.22	3.26	3.96	2.68	------	------	------	22.65
6390	----do	White Star	Washington	D	7.20	1.39	8.59	.60	1.79	2.39	2.90	2.19	------	----	------	19.45
	Brand claiming						**9.00**			**2.47**	**3.00**	**2.00**	------	-----	-----	**19.93**
6656	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co.'s Standard Guano	Clinton	D	6.72	1.30	**8.02**	.80	1.80	2.60	3.16	2.04	------	------	-----	**19.60**
	Brand claiming						**9.00**			**2.47**	**3.00**	**3.00**	------	------	------	**21.03**
6439	Patapsco Guano Co., Baltimore, Md.	Patapsco Tobacco Fertilizer	Bethel	R	6.65	1.98	**8.63**	1.71	.86	2.57	3.12	3.25	3.25	------	6.75	21.36
	Brand claiming						**9.00**			**2.75**	**3.34**	**2.00**	------	------	------	**21.02**
6456	Roberson, J. H., & Co., Robersonville, N. C.	Roberson's Cotton Grower	Robersonville	R	7.20	2.15	9.35	1.07	1.22	**2.29**	2.78	2.70	----	----	----	**20.31**

	Brand claiming						**9.00**			**2.88**	**3.50**	**5.00**					24.83
6410	American Fertilizing Co., Norfolk, Va.	Pitt County Special Fertilizer.	Wilmington	R	6.70	1.30	**8.00**	1.62	1.76	3.39	4.12	**4.61**					25.49
	Brand claiming						**9.00**			**3.50**	**4.25**	**9.00**					**31.65**
6411	American Fertilizing Co., Norfolk, Va.	Strawberry Guano	Edenton	R	6.55	1.67	**8.22**	.95	1.28	**3.23**	3.92	**7.35**					**26.88**
	Brand claiming						**9.25**			**2.06**	**2.50**	**2.00**					**18.55**
6473	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Greenville	R	6.78	2.17	**8.95**	1.45	.76	2.21	2.68	2.25					19.15
	Brand claiming						**7.00**			**2.47**	**3.00**	**3.00**					**19.23**
6557	Imperial Co., Norfolk, Va.	Imperial Roanoke Crop Grower.	Williamston	R	7.18	1.09	8.27	1.34	1.32	2.66	3.23	**2.27**					20.31
	Brand claiming						**7.00**			**2.47**	**3.00**	**5.00**					**22.33**
6725	Martin, D. B., Co., Richmond, Va.	Martin's Claremont Vegetable Grower.	Elizab'h City	S	6.03	1.62	7.65	2.04	.76	2.80	3.40	**4.85**					23.11
	Brand claiming						**7.00**			**2.55**	**3.10**	**3.20**					**19.78**
6740	Va.-Car. Chemical Co., Richmond, Va.	Formula 44	Selma	R	6.10	1.25	7.35	1.90	.96	2.86	3.47	3.39					21.50
	Brands claiming						**7.00**			**3.30**	**4.00**	**4.00**					**23.57**
6489	American Fertilizing Co., Norfolk, Va.	American Fish Scrap Guano	Elizab'h City	R	3.03	3.71	**6.74**	1.79	1.70	3.49	4.24	**3.66**					23.70
6582	Pocomoke Guano Co., Norfolk, Va.	Faultless Ammoniated Superphosphate.	Laurinburg	S	7.20	.82	8.02	2.28	.86	3.14	3.81	4.06					23.93
6606	Southern Exchange, Maxton, N. C.	Two Fours Guano	Parkton	S	6.47	1.39	**7.86**	2.06	1.12	3.18	3.86	4.09					23.97
	Brand claiming						**7.00**			**3.30**	**4.00**	**5.00**					**24.67**
6518	Hubbard Fertilizer Co., Baltimore, Md.	Hubbard Southern Leader	Elizab'h City	R	4.33	2.84	7.17	2.08	1.04	**3.12**	**3.79**	5.34					**24.49**
	Brand claiming						**7.00**			**3.70**	**4.50**	**6.00**					**27.33**
6474	Patapsco Guano Co., Baltimore, Md.	Money Maker Guano	Greenville	S	5.78	1.71	7.49	2.39	1.35	3.74	4.54	**5.54**					27.42
	Brands claiming						**7.00**			**4.12**	**5.00**	**5.00**					**27.87**
6432	American Fertilizing Co., Norfolk, Va.	American Irish Potato Grower.	Robersonville	R	5.88	.89	**6.77**	3.72	1.29	5.01	6.08	5.27					31.42
6454	Berkley Chemical Co., Norfolk, Va.	Mascot Truck Guano	Bethel	R	5.20	1.99	7.19	2.75	1.53	4.28	5.20	5.25					28.93
6375	Imperial Co., Norfolk, Va.	Imperial Special 7 Per Cent for Potatoes and Early Truck.	Edenton	R	4.03	1.62	**5.65**	2.90	2.57	5.47	6.64	**4.82**					31.72
6479	Pamlico Chemical Co., Washington, N. C.	Pamlico Favorite Potato Guano.	Washington	S	5.15	2.09	7.24	1.45	2.93	4.38	5.32	5.46					29.60
6313	Royster, F. S., Guano Co., Norfolk, Va.	Royal Potato Guano	Bethel	R	6.13	.91	7.04	2.47	1.65	4.12	5.00	5.16					28.08
	Brands claiming						**7.00**			**4.94**	**6.00**	**5.00**					**31.07**
6374	Richmond Guano Co., Richmond, Va.	Special High Grade for Truck.	Edenton	R	6.40	1.50	7.90	1.93	3.13	5.06	6.20	5.11					32.46
6471	do	do	Washington	S	7.85	1.51	9.36	1.72	2.68	**4.40**	5.34	**4.47**					30.50

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
	MIXED FERTILIZERS.															
	Brands claiming						**7.00**			**4.12**	**5.00**	**8.00**				**$ 31.17**
6458	Bragaw Fertilizer Co., Washington, N. C.	Pamlico Trucker	Washington	R	5.55	1.42	**6.97**	1.62	2.55	4.17	5.06	8.28				31.61
6414	Meadows, E. H. & J. A., New Bern, N. C.	Meadows' Great Potato Guano.	Kinston	S	4.00	3.08	7.08	2.78	1.22	**4.00**	4.86	8.20				**30.99**
	Brands claiming						**7.00**			**5.76**	**7.00**	**7.00**				**36.46**
6358	American Fertilizing Co., Norfolk, Va.	American 7-7-7 for Irish Potatoes.	Washington	R	5.48	1.52	7.00	3.29	2.68	5.97	7.25	**6.68**				36.93
6484	Roberson, J. H., & Co., Robersonville, N. C.	Roberson's Special Potato Grower.	Robersonville	S	5.03	1.67	**6.70**	3.29	2.31	**5.60**	6.80	7.76				**36.41**
	Brand claiming						**7.00**			**3.30**	**4.00**	**8.00**				**27.97**
6381	Baugh & Sons Co., Norfolk, Va.	Glover's Special Potato Guano.	Elizab'h City	R	5.35	2.18	7.53	2.08	1.22	3.30	4.00	9.19				29.75
	Brands claiming						**6.00**			**3.30**	**4.00**	**4.00**				**22.67**
6655	Imperial Co., Norfolk, Va.	Imperial Fish and Bone	Washington	S	5.42	1.20	6.62	1.06	2.64	3.80	4.61	6.76				28.21
6559	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Strawberry Guano	Eilzab'h City	R	5.20	.84	6.04	1.50	1.92	3.42	4.15	4.61				23.84
	Brands claiming						**6.00**			**3.30**	**4.00**	**8.00**				**27.07**
6706	Acme Mfg. Co., Wilmington, N. C.	Acme Truck Grower	Mount Olive	R	4.70	1.51	6.21	2.25	1.09	3.34	4.05	8.07				27.49
6532	Martin, D. B., Co., Richmond, Va.	Early Trucker and Vegetable Grower.	Elizab'h City	R	4.65	2.05	6.70	2.38	.94	3.32	4.03	8.54				28.37
6354	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Vegetable Compound.	----do	R	4.45	1.33	**5.78**	1.62	1.58	**3.20**	3.88	**7.95**				**26.23**
	Brand claiming						**6.00**			**4.12**	**5.00**	**5.00**				**26.97**
6382	Baugh & Sons Co., Norfolk, Va.	Baugh's 5-6-5 Guano	Elizab'h City	R	4.45	2.04	6.49	1.82	2.50	4.32	5.24	5.26				28.46
	Brands claiming						**6.00**			**4.12**	**5.00**	**7.00**				**29.17**
6359	American Fertilizing Co., Norfolk, Va.	Special Potato Manure	Washington	R	5.53	1.41	6.94	3.11	1.42	4.53	5.50	**6.79**				31.38
6377	----do	----do	Elizab'h City	R	5.18	1.07	6.25	2.08	1.20	4.28	5.20	**6.78**				29.77

6418	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute for Potatoes and All Vegetables.	Kinston	R	4.78	1.76	6.51	2.73	1.45	4.18	5.08	7.42				30.35
9519	Hubbard Fertilizer Co., Baltimore, Md.	Hubbard's Early Trucker	Elizab'h City	S	5.58	1.39	6.97	2.80	1.20	**4.00**	4.86	9.04				31.82
6426	Imperial Co., Norfolk, Va.	Imperial Potato Guano	Kinston	R	6.20	.84	7.04	2.67	1.28	**3.95**	4.80	**6.85**				29.27
6531	Martin, D. B., Co., Richmond, Va.	Martin's Animal Bone Potato Guano.	Elizab'h City	R	4.40	2.20	6.60	3.14	1.08	4.22	5.12	7.47				30.61
6451	Miller Fertilizer Co., Baltimore, Md.	High Grade Potato	do	R	5.13	1.11	6.24	1.92	1.93	**3.85**	4.68	7.13				**28.47**
6629	Patapsco Guano Co., Baltimore, Md.	Patapsco Potato Guano	Mount Olive	R	4.67	2.28	6.95	2.38	1.20	**3.58**	4.35	**5.91**				**26.72**
7353	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Early Vegetable Manure.	Elizab'h City	R	4.15	3.88	8.03	2.74	1.58	4.32	5.24	7.68				32.52
6433	Va.-Car. Chemical Co., Richmond, Va.	V.-C. C. Co.'s Invincible High Grade Fertilizer for Truck.	do	S	4.28	1.94	6.22	3.05	1.33	4.38	5.32	**6.63**				27.97
	Brand claiming						**6.00**			**4.94**	**6.00**	**6.00**				**31.26**
6652	Mapes Formula and Peruvian Guano Co., New York, N. Y.	Mapes' Vegetable Manure	Washington	D	4.42	1.85	6.27	3.76	1.42	5.18	6.29	7.12				33.67
	Brands claiming						**6.00**			**5.77**	**7.00**	**5.00**				**33.40**
6481	Bragaw Fertilizer Co., Washington, N. C.	Riverview Trucker	Washington	S	5.28	1.52	6.80	3.22	2.12	**5.34**	6.48	**4.83**				**32.26**
6385	Baugh & Sons Co., Norfolk, Va.	Baugh's 7 Per Cent Potato Guano.	Elizab'h City	R	4.73	1.99	6.72	3.11	2.47	**5.58**	6.78	5.25				33.58
6561	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Special Truck Fertilizer	Robersonville	S	4.53	1.06	**5.59**	3.32	1.92	**5.24**	6.36	**4.82**				**30.77**
6356	Pocomoke Guano Co., Norfolk, Va.	Seaboard Popular Trucker	Elizab'h City	R	4.30	2.13	6.43	4.20	1.65	5.85	7.10	5.20				34.32
6485	Roberson, J. H., & Co., Robersonville, N. C.	Roberson's Potato Grower	Robersonville	S	4.50	1.49	**5.99**	3.50	2.03	**5.53**	6.71	6.26				33.84
	Brand claiming						**6.00**			**8.23**	**10.00**	**2.00**				**39.69**
6483	Richmond Guano Co., Richmond, Va.	High Grade 10 Per Cent Cabbage Guano.	Washington	R	4.75	1.61	6.36	4.12	3.90	**8.02**	9.74	2.34				**39.58**
	Brand claiming						**6.40**			**2.13**	**2.60**	**3.00**				**17.07**
6581	Laurinburg Oil Co., Laurinburg, N. C.	Floradora Complete Guano	Laurinburg	R	5.28	1.27	6.55	.16	1.92	2.08	2.53	3.97				18.37
	Brands claiming						**5.00**			**8.25**	**10.00**	**2.50**				**39.43**
6468	Imperial Co., Norfolk, Va.	Imperial Guano	Washington	R	4.70	.60	5.30	5.52	1.68	**7.20**	8.74	2.97				**36.11**
6460	Pamlico Chemical Co., Washington, N. C.	Cowell's Great Cabbage Grower.	do	S	3.10	1.65	**4.75**	4.93	2.91	**7.84**	9.52	3.07				**38.23**
	Brand claiming						**4.00**			**2.47**	**3.00**	**5.00**				**18.73**
6536	Imperial Co., Norfolk, Va.	Cubanola Tobacco Guano	Edenton	R	3.00	1.14	4.14	1.20	2.06	3.26	3.96	5.90	5.90		5.55	22.93
	Brand claiming						**8.00**				**4.00**					**11.60**
6731	Va.-Car. Chemical Co., Richmond, Va.	Va. State Fertilizer Co.'s Gilt Edge Dissolved Bone and Potash.	Burlington	R	4.95	4.98	9.93				4.22					13.57

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					MIXED FERTILIZERS.											
	Brand claiming						**8.00**				**5.00**					**$12.70**
6758	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Star Bone and Potash.	Burlington	R	6.30	1.20	**7.50**				5.29					**12.56**
	Brands claiming						**10.00**				**2.00**					**11.20**
6488	American Fertilizing Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Elizab'h City	R	5.13	5.06	10.19				2.20					11.59
6695	Armour Fertilizer Works, Baltimore, Md.	M. H. White & Co.'s Special Corn Mixture.	Hertford	D	7.50	2.14	**9.64**				**1.90**					**10.76**
6626	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	Clinton	R	6.90	2.45	**9.35**				**1.84**					**10.43**
6726	Imperial Co., Norfolk, Va.	Bone and Potash	Edenton	R	7.93	2.18	10.11				**1.95**					11.24
6761	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone and Potash.	Burlington	R	6.83	3.27	10.10				**1.70**					**10.96**
6719	Piedmont-Mt Airy Guano Co., Baltimore, Md.	Piedmont Farmers' High Grade Bone and Potash.	do	R	8.18	1.42	**9.60**				2.04					**10.38**
6783	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Greensboro	R	8.18	3.12	11.30				**1.86**					12.21
6775	Royster, F. S., Guano Co., Richmond, Va.	Royster's Bone and Potash	Mount Olive	S	7.03	2.62	**9.65**				**1.91**					**10.78**
6642	Union Guano Co., Winston, N. C.	Union Bone and Potash	Mebane	R	6.35	3.37	**9.72**				**1.71**					**10.63**
6750	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s McGavock's Special Potash Mixture.	Burlington	R	5.48	4.40	**9.88**				**1.80**					**10.87**
6627	do	Durham Fertilizer Co.'s Bone and Potash Mixture.	Clinton	R	7.65	2.10	**9.75**				2.04					**11.01**
6746	do	Old Dominion Guano Co.'s High Grade Alkaline Bone and Potash.	Burlington	R	5.13	4.51	**9.64**				2.42					11.33
6810	do	Powers, Gibbs & Co.'s Dissolved Bone and Potash.	Princeton	R	9.55	1.63	11.28				2.77					13.19
6802	do	Va.-Car. Chemical Co.'s Dissolved Bone and Potash.	Tunis	R	4.30	5.22	**9.52**				**1.96**					**10.72**

	Brand claiming						**10.50**				**1.50**						**11.10**
6749	Va.-Car. Chemical Co., Richmond, Va.	Durham Fertilizer Co.'s Great Wheat and Corn Grower.	Burlington	R	7.45	2.69	**10.14**				**1.46**						10.73
	Brands claiming						**10.00**				**4.00**						**13.40**
6762	Navassa Guano Co., Wilmington, N. C.	Navassa Wheat and Grass Grower.	Burlington	R	7.43	2.77	10.20				**3.56**						**12.10**
6701	Pocomoke Guano Co., Norfolk, Va.	Pocomoke Bone and Potash Mixture.	Edenton	R	5.90	3.92	**9.82**				**3.80**						**13.02**
6782	Powhatan Chemical Co., Richmond, Va.	Magic Bone and Potash Mixture.	Greensboro	R	8.73	2.33	11.06				**3.59**						13.90
6320	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash	Hertford	S	9.24	.74	**9.98**				**3.01**						**12.21**
6643	Union Guano Co., Winston, N. C.	Quaker Grain Mixture	Mebane	R	7.55	2.54	10.09				4.02						13.50
6811	Va.-Car. Chemical Co., Richmond, Va.	Va.-Car. Chemical Co.'s Special Bone Mixture.	Pine Level	R	7.40	2.65	10.05				**3.60**						**13.00**
	Brands claiming						**10.00**				**5.00**						**14.50**
6727	Armour Fertilizer Works, Baltimore, Md.	Armour Phosphoric Acid and Potash.	Elizab'h City	R	7.83	1.94	**9.77**				**3.13**						**12.23**
6747	Va.-Car. Chemical Co., Richmond, Va.	Lynchburg Guano Co. Alpine Mixture.	Burlington	R	7.60	2.42	10.02				**4.42**						**13.88**
6730	----do	Va. State Fertilizer Co.'s Mountain Top Bone and Potash Mixture.	----do	R	5.63	4.44	10.07				5.91						15.56
	Brand claiming						**11.00**				**2.00**						**12.10**
6406	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Elizab'h City	R	8.43	2.43	**10.06**				**1.90**						**11.86**
	Brand claiming						**11.00**				**5.00**						**15.40**
6790	Patapsco Guano Co., Baltimore, Md.	Patapsco High Grade Bone and Potash.	Neals	S	8.48	2.40	**10.88**				**4.70**						**14.96**
	Brand claiming						**12.00**				**4.00**						**15.20**
6647	Navassa Guano Co., Wilmington, N. C.	Navassa Gray Land Mixture.	Mebane	D	9.38	3.12	12.50				**2.47**						**13.96**

Raw or Unmixed Fertilizer Materials.

	Brands claiming						**12.00**										**9.60**
6646	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Mebane	R	9.45	3.20	12.65										10.12
6812	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone.	Princeton	R	6.73	5.21	**11.94**										**9.55**
6751	Union Guano Co., Winston, N. C.	Union 12 Per Cent Acid Phosphate.	Burlington	R	6.40	5.25	**11.65**										**9.32**
6756	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Oil and Fertilizer Co.'s Charlotte Dissolved Bone.	----do	R	5.65	5.85	**11.50**										**9.20**

N. D, R. S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					RAW OR UNMIXED FERTILIZER MATERIALS.											
6744	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Guano Co.'s Royster's Acid Phosphate.	Burlington	R	6.30	5.72	12.02									$ 9.61
	Brands claiming						**13.00**									**10.40**
6712	Acme Manufacturing Co., Wilmington, N. C.	Acme Acid Phosphate	Bladenboro	R	11.08	2.97	14.05									11.24
6601	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Dissolved Bone	Pittsboro	R	9.80	3.51	13.31									10.64
6714	Va.-Car. Chemical Co., Richmond, Va.	Atlantic and Va. Fertilizer Co.'s Crenshaw's Acid Phosphate.	Goldsboro	R	10.88	2.57	13.45									10.76
	Brands claiming						**14.00**									**11.20**
6572	Acme Manufacturing Co., Wilmington, N. C.	High Grade Acid Phosphate	Warsaw	R	12.00	2.25	14.25									11.40
6345	American Agricultural Chemical Co., New York, N. Y.	Lazaretto Dissolved Bone Phosphate.	Edenton	R	8.93	9.45	**13.88**									**11.10**
6629	Armour Fertilizer Works, Baltimore, Md.	Armour's Star Phosphate	Hertford	R	10.38	3.44	**13.82**									**11.05**
6612	Arps, Geo. L., & Co., Norfolk, Va.	Acid Phosphate	Edenton	R	9.70	4.68	14.38									11.50
6602	Atlantic Chemical Co., Norfolk, Va.	Atlantic 14 Per Cent Acid Phosphate.	Pittsboro	R	11.27	2.82	14.09									11.34
6400	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	Edenton	R	12.10	2.20	14.30									11.44
6523	Berkley Chemical Co., Norfolk, Va.	Berkley Acid Phosphate	do	R	9.28	4.75	14.03									11.22
6614	Bragaw Fertilizer Co., Washington, N. C.	Long Acre Phosphate	Washington	R	11.70	3.07	14.77									11.81
6592	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Dissolved Bone	Everetts	D	9.58	2.87	**12.45**									**9.96**
6671	do	Climax Dissolved Bone	Maxton	R	9.97	2.89	**12.86**									10.28
6349	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Edenton	R	10.28	2.54	**12.82**									**10.25**
6703	Harrell, S. B., & Co., Norfolk, Va.	Harrell's Acid Phosphate	do	R	8.98	5.16	14.14									11.31

6517	Hubbard Fertilizer Co., Baltimore, Md.	Hubbard's H. G. Acid Phosphate.	Edenton	R	11.95	2.55	14.50														11.60
6682	---do	Hubbard's Soluble Bone Phosphate.	Scotl'd Neck	R	12.48	3.06	15.54														12.43
6535	Imperial Co., Norfolk, Va.	Imperial High Grade Acid Phosphate.	Edenton	R	11.33	2.51	**13.84**														**11.07**
6702	Martin, D. B., Co., Richmond, Va.	Martin's Acid Phosphate	do	R	11.78	2.39	14.17														11.33
6590	Navassa Guano Co., Wilmington, N. C.	Navassa 14 Per Cent Acid Phosphate.	Warsaw	R	10.53	2.86	**13.49**														**10.79**
6510	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Acid Phosphate	Ayden	R	10.18	3.54	**13.72**														**10.97**
6586	Patapsco Guano Co., Baltimore, Md.	Patapsco Pure Dissolved S. C. Phosphate.	Sanford	R	9.83	4.36	14.19														11.35
6784	Powhatan Chemical Co., Richmond, Va.	High Grade Acid Phosphate	Greensboro	R	11.05	3.17	14.22														11.37
6679	Rasin-Monumental Co., Baltimore, Md.	Rasin Acid Phosphate	Scotl'd Neck	R	9.95	3.20	**13.15**														**10.52**
6487	Royster, F. S., Guano Co., Norfolk, Va.	Royster's 14 Per Cent Acid Phosphate.	Roper	R	10.70	2.85	**13.55**														**10.84**
6603	Southern Exchange Co., Maxton, N. C.	S. E. C. Acid Phosphate	Parkton	R	12.02	2.68	14.50														11.60
6650	Swift's Fertilizer Works, Atlanta, Ga.	High Grade Swift's Cultivator.	Washington	R	10.18	4.44	14.62														11.68
6757	Union Guano Co., Winston, N. C.	Union High Grade Acid Phosphate.	Burlington	R	9.15	5.07	14.22														11.37
6699	Upshur, R. L., Norfolk, Va.	Upshur's High Grade Acid Phosphate.	Hertford	D	11.58	2.44	14.02														11.21
6796	Va.-Car. Chemical Co., Richmond, Va.	Southern Chemical Co.'s Red Cross Acid Phosphate.	Graham	R	10.68	2.86	**13.54**														**10.83**
6492	Winborne Guano Co., Tyner, N. C.	High Grade Acid Phosphate	Tyner	R	9.90	3.79	14.80														11.84
	Brands claiming						**16.00**														**12.80**
6621	Acme Manufacturing Co., Wilmington, N. C.	Acid Phosphate	Rockingham	R	16.21	1.17	17.38														13.90
6402	American Fertilizing Co., Norfolk, Va.	American High Grade Acid Phosphate.	Greenville	D	11.65	2.64	**14.29**														**11.43**
6617	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate, 16 Per Cent.	Edenton	R	13.65	3.19	16.84														13.47
6640	Hampton Guano Co., Norfolk, Va.	Supreme Acid Phosphate	---do	R	11.83	3.86	**15.69**														**12.55**
6654	Imperial Co., Norfolk, Va.	Imperial High Grade Tennessee Acid Phosphate.	Greenville	R	13.95	2.25	16.20														12.96
6760	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Burlington	R	12.10	3.59	**15.69**														**12.55**
6587	Patapsco Guano Co., Baltimore, Md.	Florida Soluble Phosphate	Sanford	R	12.05	15.96	16.01														12.80
6767	Richmond Guano Co., Richmond, Va.	R. E. X. Dissolved Bone Phosphate.	Monroe	D	10.63	4.05	**14.68**														**11.74**
6664	Southern Exchange Co., Maxton, N. C.	S. E. C. Acid Phosphate	Maxton	R	10.57	4.38	**14.95**														**11.96**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
					RAW OR UNMIXED FERTILIZER MATERIALS.											
6663	Swift Fertilizer Works, Atlanta, Ga.	High Grade Swift's Special H. G. Acid Phosphate.	Maxton	D	13.12	2.93	16.05	-----	-----	-----	-----	-----	-----	-----	-----	$ 12.84
6600	Va.-Car. Chemical Co., Richmond, Va.	Click's 16 Per Cent Acid Phosphate.	Pittsboro	R	12.32	3.40	**15.72**	-----	-----	-----	-----	-----	-----	-----	-----	**12.57**
6765	----do	Durham Fertilizer Co.'s Best Acid Phosphate.	Monroe	R	12.63	3.26	**15.89**	-----	-----	-----	-----	-----	-----	-----	-----	**12.71**
	Brand claiming				-----	-----	-----	-----	-----	-----	-----	**2.00**	-----	-----	-----	**2.00**
6605	Lee, A. S., & Sons Co., Richmond, Va.	Lee's Prepared Agricultural Lime.	Red Springs	R	-----	-----	-----	-----	-----	-----	-----	2.68	-----	-----	-----	2.68
	Brands claiming				-----	-----	-----	-----	-----	-----	-----	**12.00**	-----	-----	-----	**12.00**
6573	Acme Manufacturing Co., Wilmington, N. C.	Genuine German Kainit	Warsaw	S	-----	-----	-----	-----	-----	-----	-----	12.06	-----	-----	-----	12.06
6401	American Agricultural Chemical Co., N. Y.	----do	Edenton	S	-----	-----	-----	-----	-----	-----	-----	12.46	-----	-----	-----	12.46
6728	American Fertilizing Works, Baltimore, Md.	----do	Hertford	R	-----	-----	-----	-----	-----	-----	-----	**11.78**	-----	-----	-----	**11.78**
6613	Arps, Geo. L., & Co., Norfolk, Va.	----do	Edenton	S	-----	-----	-----	-----	-----	-----	-----	12.06	-----	-----	-----	12.06
6344	Baugh & Sons Co, Norfolk, Va.	----do	----do	S	-----	-----	-----	-----	-----	-----	-----	**11.92**	-----	-----	-----	**11.92**
6525	Berkley Chemical Co., Norfolk, Va.	----do	----do	S	-----	-----	-----	-----	-----	-----	-----	13.08	-----	-----	-----	13.08
6717	Best & Thompson, Goldsboro, N. C.	----do	Goldsboro	S	-----	-----	-----	-----	-----	-----	-----	**11.78**	-----	-----	-----	**11.78**
6341	Columbia Guano Co., Norfolk, Va.	----do	Edenton	R	-----	-----	-----	-----	-----	-----	-----	12.22	-----	-----	-----	12.22
6685	Farmers Cotton Oil Co., Wilson, N. C.	----do	Aulander	S	-----	-----	-----	-----	-----	-----	-----	12.93	-----	-----	-----	12.93
6571	Hall & Pearsall, Wilmington, N. C.	----do	Magnolia	S	-----	-----	-----	-----	-----	-----	-----	**11.56**	-----	-----	-----	**11.56**
6704	Hampton Guano Co, Norfolk, Va.	----do	Edenton	S	-----	-----	-----	-----	-----	-----	-----	**11.68**	-----	-----	-----	**11.68**
6683	Hubbard Fertilizer Co., Baltimore, Md.	----do	Scotl'd Neck	B	-----	-----	-----	-----	-----	-----	-----	12.92	-----	-----	-----	12.92
6524	Imperial Co., Norfolk, Va.	----do	Edenton	R	-----	-----	-----	-----	-----	-----	-----	12.72	-----	-----	-----	12.72
6409	Martin, D. B., Co., Richmond, Va.	----do	New Bern	S	-----	-----	-----	-----	-----	-----	-----	12.78	-----	-----	-----	12.78
6408	Meadows, E. H. & J. A., New Bern, N. C.	----do	Kinston	B	-----	-----	-----	-----	-----	-----	-----	12.72	-----	-----	-----	12.72

6585	McNair, John F., Laurinburg, N. C.	---do		Laurinburg	S									12.34				12.34
6591	Navassa Guano Co., Wilmington, N. C.	---do		Warsaw	S									12.50				12.50
6596	Ober, G., & Sons, Baltimore, Md.	---do		Tunis	S									13.24				13.24
6552	Pearsall & Co., Wilmington, N. C.	---do		Wilmington	S									13.04				13.04
6724	Piedmont-Mount Airy Guano Co., Baltimore, Md.	---do		Edenton	S									**11.04**				**11.04**
6337	Pocomoke Guano Co., Norfolk, Va.	---do		Hertford	S									**11.82**				**11.82**
6680	Powhatan Chemical Co., Richmond, Va.	---do		Scotl'd Neck	S									12.00				12.00
6736	Rasin-Monumental Co., Baltimore, Md.	---do		Waxhaw	S									**11.84**				**11.84**
6334	Richmond Guano Co., Richmond, Va.	---do		Edenton	R									13.36				13.36
6319	Royster, F. S., Guano Co., Norfolk, Va.	---do		---do	S									12.10				12.10
6604	Southern Exchange Co., Maxton, N. C.	---do		Parkton	S									12.68				12.68
6625	Stackhouse, Wade, Dillon, S. C.	---do		Rockingham	S									12.40				12.40
6651	Swift Fertilizer Works, Atlanta, Ga.	---do		Washington	S									12.00				12.00
6658	Union Guano Co., Winston, N. C.	---do		Clinton	S									12.56				12.56
6721	Upshur, R. L., Norfolk, Va.	---do		Hancock	S									12.92				12.92
6333	Va.-Car. Chemical Co., Richmond, Va.	---do		Edenton	R									**11.90**				**11.90**
6493	Winborne Guano Co., Tyner, N. C.	---do		Tyner	S									12.00				12.00
	Brands claiming													**48.00**				**48.00**
6616	Baugh & Sons Co., Norfolk, Va.	Muriate of Potash		Edenton	R									50.64				50.64
6521	Columbia Guano Co., Norfolk, Va.	---do		---do	B P									50.72				50.72
6781	Va.-Car. Chemical Co., Richmond, Va.	---do		Greensboro	S									**47.12**				**47.12**
6710	do	Sulphate of Potash		Lumberton	N									**46.80**				**46.80**
	Brands claiming													**50.00**				**50.00**
6670	Calder Bros., Wilmington, N. C.	Muriate of Potash		Maxton	B									50.80				50.80
6553	Pearsall & Co., Wilmington, N. C.	---do		Wilmington	R									**46.96**				**46.96**
6691	Pocomoke Guano Co., Norfolk, Va.	---do		Norfolk	B									**48.84**				**48.84**
6343	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	---do		Washington	R									**49.32**				**49.32**
	Brands claiming													**14.83**	**18.00**			**53.38**
6779	Armour Fertilizer Works, Wilmington, N. C.	Nitrate of Soda		Smithfield	B									15.64	18.99			56.30
6769	MacMurphy Co., Charleston, S. C.	---do		Wadesboro	B									15.24	18.50			54.86
6768	Parsons & Hardison, Wadesboro, N. C.	---do		---do	B									15.56	18.89			56.00
	Brand claiming													**15.23**	**18.50**			**54.83**
6615	Baugh & Sons Co., Norfolk, Va.	---do		Edenton	B									15.88	19.28			57.16

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse, P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.											Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Potash from Muriate.	Potash from Sulphate.	Chlorine.	
RAW OR UNMIXED FERTILIZER MATERIALS.																
	Brands claiming									**15.65**	**19.00**					**$56.34**
6342	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Nitrate of Soda	Washington	B						15.65	19.00					56.34
6520	Columbia Guano Co., Norfolk, Va.	do	Edenton	B P						**15.52**	18.84					**55.87**
6620	Imperial Co., Norfolk, Va.	do	do	B						**15.14**	18.38					**54.50**
6336	Richmond Guano Co., Richmond, Va.	do	do	B						15.89	19.28					57.20
6665	Southern Exchange Co., Maxton, N. C.	do	Maxton	B						**15.64**	18.99					**56.30**
6494	Va.-Car. Chemical Co., Richmond, Va.	do	Edenton	B						**15.19**	18.44					**54.68**
	Brands claiming									**3.71**	**4.50**					29.21
6801	Baugh & Sons Co., Norfolk, Va.	Baugh's Raw Bone	Greensboro							3.80	4.61					[1]29.45
6799	Ober, G., & Sons Co., Baltimore, Md.	Pure Raw Bone Meal	Burlington							4.04	4.90					[2]30.05
	Brand claiming									**5.56**	**6.75**	**2.25**				**30.45**
6686	Coe-Mortimer Co., Charleston, S. C.	Genuine Peruvian Guano	Maxton	B						**5.09**	6.18	**1.75**				[3]**28.39**
	Brand claiming									**3.54**	**4.30**	**2.80**				**27.41**
6346	Coe-Mortimer Co., Charleston, S. C.	do	Bethel	B						**3.38**	**4.10**	**2.78**				[4]**27.20**
	Brand claiming									**2.80**	**3.40**	**2.80**				**25.90**
6364	Coe-Mortimer Co., Charleston, S. C.	do	Lumberton	B						2.88	3.50	**2.51**				[5]**24.97**

[1]Total Phosphoric Acid found, 20.90, valued at 3½ cents per pound.
[2]Total Phosphoric Acid found, 20.43, valued at 3½ cents per pound.
[3]Total Phosphoric Acid found, 9.00, valued at 3½ cents per pound.
[4]Total Phosphoric Acid found, 15.66, valued at 3½ cents per pound.
[5]Total Phosphoric Acid found, 15.68, valued at 3½ cents per pound.

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	Relative Value per Ton at Factory.
					MIXED FERTILIZERS.								
	Brands claiming						**8.00**			**1.65**	**2.00**	**2.00**	**$ 15.82**
6430	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound.	Kinston	R	7.30	1.67	8.97	.43	1.58	2.01	2.44	2.02	18.13
6383	do	Baugh's Fish Scrap	Elizabeth City	S	6.25	2.22	8.47	.51	1.52	2.03	2.46	2.12	17.87
6337	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	New Bern	S	7.38	.65	8.03	1.23	.43	1.66	2.02	2.00	15.90
6467	Imperial Co., Norfolk, Va.	Imperial Champion Guano	Washington	S	6.68	2.01	8.69	.61	1.14	1.75	2.12	2.04	16.88
6469	do	Imperial Standard Pre'um Guano	do	S	7.08	1.24	8.32	.78	1.12	1.90	2.30	2.12	17.23
6416	Meadows, E. H. & J. A., Co., New Bern, N. C.	Meadows' Cotton Guano	Kinston	S	6.98	1.32	8.30	.35	1.30	1.65	2.00	2.20	16.32
6355	Pocomoke Guano Co., Norfolk, Va.	Pamlico Superphosphate	Hertford	S	6.38	1.74	8.12	.86	.92	1.78	2.16	2.05	16.50
6325	Powhatan Chemical Co., Richmond, Va.	Standard Magic Cotton Grower	New Bern	R	5.13	3.69	8.82	1.36	.73	2.09	2.54	2.30	18.61
6311	Royster, F. S., Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Greenville	R	6.63	.93	7.56	.63	1.20	1.83	2.22	2.39	16.56
6316	do	do	New Bern	S	7.30	.82	8.12	1.32	.33	1.65	2.00	2.03	15.97
6366	Va.-Car. Chemical Co., Richmond, Va.	Plant Food	Kinston	D	5.58	2.12	7.70	.28	1.53	1.81	2.20	2.38	16.60
	Brands claiming						**8.00**			**2.47**	**3.00**	**2.00**	**19.03**
6449	Home Fert. Chemical Co., Baltimore, Md.	Phœnix Crop Grower	Greenville	R	6.50	1.54	8.04	.63	2.07	2.70	3.28	2.61	20.63
6368	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Oil and Fertilizer Co.'s Special 3 Per Cent Guano.	Lumberton	D	6.30	1.35	**7.65**	.85	1.88	2.73	3.32	2.25	20.00
	Brand claiming						**8.00**			**0.82**	**1.00**	**4.00**	**14.80**
6357	Baugh & Sons Co., Norfolk, Va.	Baugh's Excelsior Guano	Edenton	R	4.40	3.42	**7.82**	.42	.82	1.24	1.50	4.68	17.02
	Brand claiming						**8.00**			**2.47**	**3.00**	**2.50**	**19.58**
6360	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Lumberton	R	6.60	1.59	8.19	1.04	1.55	2.59	3.14	2.52	20.24
	Brands claiming						**8.00**			**2.47**	**3.00**	**3.00**	**20.13**
6363	Armour Fert. Works, Wilmington, N. C.	Armour Cotton Special Fertilizer	Lumberton	R	6.65	1.37	8.02	2.08	1.02	3.10	3.76	3.65	**23.32**
6384	Baugh & Sons Co., Norfolk, Va.	Baugh's Grand Rapid H. G. Truck Guano.	Elizabeth City	R	6.70	1.45	8.15	1.30	1.14	**2.44**	2.96	3.25	20.42
6455	Caraleigh Phos. and Fert. Works, Raleigh, N. C.	Horne's Best	Greenville	R	5.90	1.65	**7.55**	.36	2.29	2.65	3.22	3.17	**19.21**
6349	Columbia Guano Co., Norfolk, Va.	Olympia Cotton Guano	Edenton	R	0.95	1.04	**7.99**	1.30	1.35	**2.68**	3.22	3.35	21.20
6436	Pamlico Chemical Co., Washington, N. C.	Farmers' Best Friend	Washington	R	6.75	2.22	8.97	2.06	.49	2.55	3.10	3.09	21.41
6372	Richmond Guano Co., Richmond, Va.	Gilt Edge H. G. Fertilizer	Edenton	R	6.40	1.70	8.10	1.50	1.38	2.88	3.50	3.06	21.99
6459	Swift Fertilizer Works, Atlanta, Ga.	Swift's Ruralist H. G. Guano	Greenville	R	7.33	1.79	9.12	.59	2.38	2.97	3.60	4.05	24.24
6330	Va.-Car. Chemical Co., Richmond, Va.	Norfolk and Car. Chem. Co.'s Amazon H. G. Manure.	New Bern	R	5.45	2.07	**7.52**	.94	1.40	2.34	2.84	4.32	20.64

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.								Relative Value per Ton at Factory.
					Water-soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	
				MIXED FERTILIZERS.									
6328	Va.-Car. Chemical Co., Richmond, Va.	V.-C. C. Co.'s Farmers' Friend H. G. Guano.	New Bern	R	5.93	1.65	**7.58**	1.05	1.80	2.85	3.46	3.85	$ 27.21
	Brands claiming						**8.00**			**3.29**	**4.00**	**4.00**	**24.33**
6450	Miller Fertilizer Co., Baltimore, Md.	Miller's Irish Potato	Elizabeth City	R	4.70	2.29	**6.99**	1.96	1.75	3.71	4.50	4.14	25.31
6424	Powhatan Chemical Co., Richmond, Va.	High Grade North State Special	Kinston	R	6.83	1.66	8.49	2.31	1.17	3.48	4.22	4.08	25.46
	Brand claiming						**8.00**			**3.29**	**4.00**	**5.00**	**25.53**
6434	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co. Truck Farmers' Special Am'niated Guano.	Elizabeth City	R	7.18	1.31	8.49	2.40	.78	**3.18**	**3.86**	5.19	25.75
	Brand claiming						**8.00**			**4.12**	**5.00**	**7.00**	**30.96**
6352	Armour Fertilizer Works, Baltimore, Md.	Bone, Blood and Potash	Elizabeth City	S	5.78	2.61	8.39	2.75	1.86	4.61	5.60	7.04	33.27
	Brand claiming						**9.00**			**1.85**	**2.25**	**1.00**	**16.41**
6362	Bradley Fertilizer Co., Boston, Mass.	Sea Fowl Standard Guano	Lumberton	D	5.35	3.70	9.05	.91	1.17	2.08	2.52	1.25	17.63
	Brand claiming						**9.00**			**1.65**	**2.00**	**2.00**	**16.75**
6388	American Agricultural Chemical Co., N. Y.	Gold Dust Guano	Edenton	S	7.00	1.76	**8.76**	.99	.82	1.81	2.20	2.09	**16.26**
	Brand claiming						**9.00**			**2.26**	**2.75**	**2.00**	**19.11**
6376	Imperial Co., Norfolk, Va.	Martin County Special Crop Grower.	Edenton	R	8.00	1.12	9.12	.34	2.16	2.50	3.04	2.40	20.59
	Brand claiming						**9.00**			**2.75**	**3.34**	**2.00**	**21.02**
6486	Roberson, J. H. & Co., Robersonville, N. C.	Roberson's Cotton Grower	Robersonville	R	7.20	2.15	9.35	1.07	1.22	**2.29**	**2.78**	2.70	20.31
	Brands claiming						**7.00**			**4.12**	**5.00**	**5.00**	**27.86**
6432	American Fertilizing Co., Norfolk, Va.	American Irish Potato Grower	Robersonville	R	5.88	.89	**6.77**	3.72	1.29	5.01	6.08	5.27	31.42
6454	Berkley Chemical Co., Norfolk, Va.	Mascot Truck Guano	Bethel	R	5.20	1.99	7.19	2.75	1.53	4.28	5.20	5.25	28.93
6313	Royster, F. S., Guano Co., Norfolk, Va.	Royal Potato Guano	do	R	6.13	.91	7.04	2.47	1.65	4.12	5.00	5.16	28.08
	Brand claiming						**7.00**			**4.12**	**5.00**	**7.00**	**30.07**
6461	Pamlico Chemical Co., Washington, N. C.	Pamlico Potato Guano	Washington	R	5.10	1.99	7.09	1.84	2.72	4.56	5.54	7.52	32.44
	Brand claiming						**7.00**			**4.12**	**5.00**	**8.00**	**31.17**
6459	Bragaw Fertilizer Co., Washington, N. C.	Pamlico Trucker	Washington	R	5.55	1.42	**6.97**	1.62	2.55	4.17	5.06	8.28	31.64
	Brand claiming						**7.00**			**3.30**	**4.00**	**8.00**	**27.97**
6381	Baugh & Sons Co., Norfolk, Va.	Glover's Special Potato Guano	Elizabeth City	R	5.35	2.18	7.53	2.08	1.22	3.30	4.00	9.19	29.75
	Brand claiming						**6.00**			**4.12**	**5.00**	**5.00**	**26.97**
6382	Baugh & Sons Co., Norfolk, Va.	Baugh's 5-6-5 Guano	Elizabeth City	R	4.45	2.04	6.49	1.82	2.50	4.32	5.24	5.26	28.46

	Brands claiming						**6.00**			**4.12**	**5.00**	**7.00**	**29.16**
6418	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute for Potatoes and All Vegetables.	Kinston	R	4.78	1.76	6.54	2.73	1.45	4.18	5.08	7.42	30.35
6451	Miller Fertilizer Co., Baltimore, Md.	High Grade Potato	Elizabeth City	R	5.13	1.11	6.24	1.92	1.93	**3.85**	**4.68**	7.13	**28.47**
6353	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Early Vegetable Manure.	do	R	4.15	3.88	8.03	2.74	1.58	4.32	5.24	7.68	32.52
	Brands claiming						**6.00**			**5.76**	**7.00**	**5.00**	**33.36**
6385	Baugh & Sons Co., Norfolk, Va.	Baugh's 7 Per Cent Potato Guano	Elizabeth City	R	4.73	1.99	6.72	3.11	2.47	**5.58**	**6.78**	5.25	33.58
6356	Pocomoke Guano Co., Norfolk, Va.	Seaboard Popular Trucker	do	R	4.30	2.13	6.43	4.20	1.65	5.85	7.10	5.20	34.32
	Brand claiming						**10.00**					**2.00**	**11.20**
6488	American Fertilizing Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Elizabeth City	R	5.13	5.06	10.19					2.20	11.59

Raw or Unmixed Fertilizer Materials.

	Brands claiming						**14.00**						**11.20**
6345	American Agricultural Chemical Co., N. Y.	Lazaretto Dissolved Bone Phosphate.	Edenton	R	8.93	4.95	**13.88**						**11.10**
6400	Baugh & Sons Co., Norfolk, Va.	Baugh's H. G. Acid Phosphate	do	R	12.10	2.20	14.30						11.44
6340	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	do	R	10.28	2.54	**12.82**						**10.25**
6517	Hubbard Fertilizer Co., Baltimore, Md.	Hubbard's H. G. Acid Phosphate	do	R	11.95	2.55	14.50						11.60
	Brands claiming											**12.00**	**12.00**
6401	American Agricultural Chemical Co., N. Y.	Genuine German Kainit	Edenton	S								12.46	12.46
6344	Baugh & Sons Co., Norfolk, Va.	do	do	S								**11.92**	**11.92**
6341	Columbia Guano Co., Norfolk, Va.	do	do	R								12.22	12.22
6409	Martin, D. B., Co., Richmond, Va.	do	New Bern	S								12.78	12.78
6408	Meadows, E. H. & J. A., Co., New Bern, N. C.	do	Kinston	B								12.72	12.72
6337	Pocomoke Guano Co., Norfolk, Va.	do	Hertford	S								**11.82**	**11.82**
6334	Richmond Guano Co., Richmond, Va.	do	Edenton	R								13.36	13.36
6319	Royster, F. S., Guano Co., Norfolk, Va.	do	do	S								12.10	12.10
6333	Va.-Car. Chemical Co., Richmond, Va.	do	do	R								**11.90**	**11.90**
6493	Winborne Guano Co., Tyner, N. C.	do	Tyner	S								12.00	12.00
	Brand claiming											**50.00**	**50.00**
6343	Caraleigh Phos. and Fert. Works, Raleigh, N. C.	Muriate of Potash		R								**49.32**	**49.32**
	Brands claiming									**15.65**	**19.00**		**56.34**
6342	Caraleigh Phos. and Fert. Works, Raleigh, N. C.	Nitrate of Soda		B						15.65	19.00		56.34
6336	Richmond Guano Co., Richmond, Va.	do		B						15.89	19.28		57.20

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.						Relative Value per Ton at Factory.
					Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	
	MIXED FERTILIZERS.										
	Brands claiming				**8.00**			**1.65**	**2.00**	**2.00**	**$15.82**
6859	Armour Fertilizer Works, Wilmington, N. C.	General Fertilizer	Wilkesboro	R	8.68	.28	1.14	**1.42**	1.72	**1.91**	**15.45**
6902	Atlantic Chemical Co., Norfolk, Va.	Atlantic Co.'s Soluble Guano	Elkin	S	**7.92**	.86	.66	**1.52**	1.85	2.31	**15.60**
6828	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Guano	Walnut Cove	R	**7.81**	.52	1.14	1.66	2.02	3.15	16.97
6836	do	Eli Ammoniated Fertilizer	Stoneville	S	8.68	.36	.68	**1.04**	1.26	2.42	**14.53**
6875	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Roxboro	S	8.05	1.16	.76	1.92	2.33	2.33	17.29
6814	Leisters' Agrl. Chemical Works, Newark, N. J	Leisters' Success Fertilizer	Mooresville	S	8.10	.80	.88	1.68	2.04	**1.93**	15.96
6894	Navassa Guano Co., Wilmington, N. C.	Navassa Grain Fertilizer	Forest City	S	**7.16**	1.14	.78	1.92	2.33	2.23	16.38
6872	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Roxboro	R	8.43	.78	1.10	1.88	2.28	2.08	17.21
6917	do	do	Mooresville	R	8.49	.78	1.06	1.84	2.23	2.19	17.22
6846	Powhatan Chemical Co., Richmond, Va.	Magic Tobacco Grower	Mt. Airy	S	8.35	.72	1.08	1.80	2.19	2.69	17.79
6888	Richmond Guano Co., Richmond, Va.	Premium Brand Fertilizer	Wilkesboro	S	8.76	.50	.78	**1.28**	1.55	2.38	**15.49**
6912	do	do	Dunn	R	8.50	.40	1.20	**1.60**	1.94	2.15	16.45
6903	Royster, F. S., Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Wilson	S	**7.88**	1.10	.52	**1.62**	1.97	2.05	**15.66**
6873	do	do	Durham	S	8.02	1.00	.68	1.68	2.04	2.13	16.11
6916	do	do	Mt. Airy	R	**7.98**	1.00	.72	1.72	2.09	2.12	16.22
6816	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Red Steer Guano	Mooresville	R	9.91	.64	.90	**1.54**	1.87	2.03	17.16
6847	Tuscarora Fertilizer Co., Wilmington, N. C.	Tuscarora Standard Fertilizer	Wilkesboro	R	**7.55**	.62	1.14	1.76	2.14	**1.66**	**15.48**
6818	Union Guano Co., Winston, N. C.	Old Honesty Guano	Mooresville	R	**7.37**	.30	1.26	**1.56**	1.89	3.00	16.02
6906	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s Anchor Brand Fertilizer	Whiteville	R	**7.59**	.62	1.00	**1.62**	1.97	**1.98**	**15.33**
6834	do	do	Stoneville	R	9.28	.24	.96	**1.20**	1.46	3.29	16.65
6876	do	Ajax C. S. M.	Oxford	D	**7.93**	.16	1.48	**1.64**	1.99	2.20	15.95
6905	do	Davie & Whittle's Owl Brand Guano.	Vineland	D	9.47	.70	.68	**1.38**	1.68	3.07	17.28
6849	do	Electric Standard Guano	Wilkesboro	R	9.25	.22	1.12	**1.34**	1.63	2.17	15.94
6866	do	Farmers' Favorite Fertilizer	Pilot Mt.	R	10.26	.36	1.08	**1.44**	1.75	2.16	19.22
6892	do	Genuine Slaughterhouse Bone Guano.	Elkin	R	**7.98**	.36	1.52	1.88	2.28	2.24	16.98
6871	do	Old Dominion Special Wheat Guano.	Winston	S	**7.77**	.84	.76	**1.60**	1.94	2.36	15.83
6847	do	Owl Brand Guano	Wilkesboro	S	8.55	.36	1.50	1.86	2.26	2.36	17.74

6897	Va.-Car. Chemical Co., Richmond, Va.	Powers, Gibbs & Co.'s Eagle Island Ammoniated Guano.	Lincolnton	S	**7.93**	.50	1.66	2.16	2.62	**1.51**	17.28
6908	do	Powers, Gibbs & Co.'s Soluble Ammoniated Guano.	Whiteville	R	8.15	.66	1.00	1.66	2.02	2.00	16.01
6900	do	Stonewall Guano	Stoneville	R	9.37	.32	1.28	**1.60**	1.94	2.14	17.03
6823	do	Travers & Co.'s Beef, Blood and Bone Fertilizer.	Statesville	R	**7.97**	.24	1.14	**1.38**	1.68	**1.88**	**14.62**
6879	do	Travers & Co.'s National Fertilizer.	Durham	D	**7.79**	1.10	.82	1.92	2.33	3.20	18.02
	Brand claiming				**8.00**			**.82**	**1.00**	**3.00**	**13.70**
6829	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Comet Guano	Stoneville	S	9.66	.12	.64	**.76**	.92	**2.07**	13.93
	Brand claiming				**8.00**			**.82**	**1.00**	**4.00**	**14.80**
6857	Powhatan Chemical Co., Richmond, Va.	Magic Grain Special	Mt. Airy	D	9.07	.16	.82	.98	1.19	**3.87**	16.24
	Brands claiming				**8.00**			**2.06**	**2.50**	**2.00**	**17.43**
6910	Navassa Guano Co., Wilmington, N. C.	Ammoniated Soluble Navassa Guano.	Wallace	R	8.20	1.04	.72	**1.76**	2.14	2.31	**16.78**
6907	Va.-Car. Chemical Co., Richmond, Va.	Travers & Co.'s Capital Cotton Fertilizer.	Vineland	R	9.48	1.02	.40	**1.42**	1.72	3.08	17.46
	Brands claiming				**8.00**			**2.06**	**2.50**	**3.00**	**18.53**
6874	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Durham	S	**7.95**	1.48	.76	2.24	2.72	3.50	19.74
6877	Va.-Car. Chemical Co., Richmond, Va.	Blue Star	do	D	**7.95**	.70	1.38	2.08	2.53	3.75	**19.39**
	Brands claiming				**8.00**			**2.47**	**3.00**	**3.00**	**20.13**
6914	Swift Fertilizer Works, Atlanta, Ga.	Swift's Ruralist Guano	Burgaw	R	8.89	.80	1.80	2.60	3.16	3.11	21.56
6817	Union Guano Co., Winston, N. C.	Union Homestead Guano	Statesville	R	**6.35**	1.66	2.12	3.78	4.59	**2.41**	23.10
6899	do	Victoria High Grade Tobacco Fertilizer.	Ararat	R	9.51	1.52	.90	**2.42**	2.94	**2.69**	20.95
6904	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Guano Co.'s Farmers' Friend Guano.	Selma	R	8.4	1.14	1.24	**2.38**	2.89	3.05	20.27
	Brand claiming				**8.00**			**3.29**	**4.00**	**4.00**	**24.47**
6913	Swift Fertilizer Works, Atlanta, Ga.	Swift's High Grade Monarch Vegetable Grower.	Chadbourn	R	8.59	.78	2.54	3.32	4.03	**3.73**	24.78
	Brand claiming				**9.00**			**.82**	**1.00**	**2.00**	**13.50**
6850	Va.-Car. Chemical Co., Richmond, Va.	Ford's Wheat and Corn Guano	Wilkesboro	R	10.25	.30	.56	.86	1.04	2.45	15.27
	Brands claiming				**9.00**			**.82**		**3.00**	**14.60**
6862	Patapsco Guano Co., Baltimore, Md.	Coon Brand Guano	Wilkesboro	R	9.23	.46	.66	1.12	1.36	3.22	16.22
6890	Va.-Car. Chemical Co., Richmond, Va.	Bigelow's Crop Grower	Forest City	S	9.02	.48	.30	**.78**	.95	**2.60**	**14.02**
	Brand claiming				**9.00**			**1.65**	**2.00**	**1.00**	**15.64**
6878	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s Star Brand Guano	Durham	R	**7.86**	.30	1.22	**1.62**	1.97	1.47	**15.00**
	Brands claiming				**9.00**			**2.06**	**2.50**	**2.00**	**18.33**
6815	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Mooresville	R	9.35	.86	1.40	2.26	2.74	2.03	19.46
6832	Va.-Car. Chemical Co., Richmond, Va.	Owl Brand Special Tobacco Guano	Stoneville	R	9.33	1.44	1.54	2.98	3.62	**1.52**	21.69
	Brand claiming				**11.00**			**2.47**	**3.00**	**4.00**	**23.93**
6895	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Oil and Fertilizer Co.'s Perfect Wheat Grower.	Elkin	R	11.32	1.04	.98	2.62	3.18	**2.87**	**23.56**
	Brand claiming				**6.00**			**4.12**	**5.00**	**7.00**	**29.17**
6911	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano	Chadbourn	S	6.84	3.32	1.12	4.44	5.39	8.10	32.38
	Brand claiming				**7.00**			**8.24**	**10.00**	**2.00**	**40.64**
9909	American Fertilizing Co., Norfolk, Va.	Ten Per Cent Ammonia Guano	Wallace	S	7.70	6.02	1.32	**7.32**	8.89	2.72	**38.36**

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.						Relative Value per Ton at Factory.
					Available Phosphoric Acid.	Water-soluble Nitrogen.	Organic Nitrogen.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	
	MIXED FERTILIZERS.										
	Brands claiming				**8.00**					**4.00**	**$ 11.60**
6827	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Buncombe Wheat Grower	Walnut Cove	R	10.97					4.42	14.73
6825	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	----do	R	8.11					**3.11**	**10.72**
6831	Richmond Guano Co., Richmond, Va.	Winter Grain and Grass Grower	----do	R	**7.74**					**3.36**	**10.60**
6840	Union Guano Co., Winston, N. C.	Union Wheat Mixture	Mt. Airy	R	9.03					**1.97**	**10.29**
6843	Va.-Car. Chemical Co., Richmond, Va.	Carr's Special Wheat Grower	----do	R	8.82					**3.64**	11.94
6841	----do	Miller's Special Wheat Mixture	Elkin	R	8.32					**3.98**	11.87
	Brands claiming				**10.00**					**2.00**	**11.20**
6858	Armour Fertilizer Works, Wilmington, N. C.	Armour's Superphosphate	Wilkesboro	D	10.13					2.18	11.51
6826	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture	Walnut Cove	R	10.64					3.64	13.58
6824	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	----do	R	**9.41**					2.13	**10.81**
6887	Richmond Guano Co., Richmond, Va.	Bone and Potash Mixture	Wilkesboro	R	10.05					2.00	11.24
6863	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Winston	S	**9.92**					**1.96**	11.08
6839	Union Guano Co, Winston, N. C.	Union Bone and Potash	Mt. Airy	R	10.58					**1.47**	**11.14**
6844	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s McGavock's Special Potash Mixture.	----do	R	10.80					**1.80**	11.70
6855	----do	Mammoth Wheat and Corn Grower	Wilkesboro	R	10.06					**1.77**	**11.00**
6867	----do	Old Dominion Co.'s Alkaline Bone and Potash.	Winston	R	10.21					**1.55**	**10.89**
6820	----do	V.-C. C. Co.'s Blue Ridge Wheat Grower.	Statesville	R	10.34					**1.76**	11 24
6819	----do	V.-C. C. Co.'s Standard Wheat Grower.	----do	R	10.00					**1.39**	**10.53**
	Brand claiming				**10.50**					**1.50**	**11.10**
6880	Va.-Car. Chemical Co., Richmond, Va.	Durham Fertilizer Co.'s Great Wheat and Corn Grower.	Roxboro	R	10.87					**1.41**	11.33

	Brands claiming				**10.00**						**4.00**	**13.40**
6860	Armour Fertilizer Works, Wilmington, N. C.	Armour's Superphosphate and Potash Fertilizer.	Wilkesboro	R	**8.91**						4.63	**13.11**
6889	Richmond Guano Co., Richmond, Va.	Rex Bone and Potash Mixture	do	R	10.77						**3.50**	14.44
6842	Va.-Car. Chemical Co., Richmond, Va.	V.-C. C. Co.'s Special Potash Mixture.	Elkin	D	11.03						**3.87**	14.18
6856	do	Winter Grain Mixture	Wilkesboro	R	**9.92**						4.22	13.57
	Brand claiming				**10.00**						**5.00**	**14.50**
6853	Tuscarora Fertilizer Co , Wilmington, N. C.	Tuscarora Alkaline	Wilkesboro	R	**9.60**						5.09	14.24
	Brand claiming										**12.00**	**12.00**
6883	Va.-Car. Chemical Co., Richmond, Va.	Genuine German Kainit	Oxford	S							13.12	13.12
	Brand claiming							**2.47**	**3.00**			**25.69**
6884	Armour Fertilizer Works, Baltimore, Md.	Armour's Bone Meal	Tobaccoville	D				**2.40**	2.91			**25.15**
	Brands claiming							**3.70**	**4.49**			[1]**28.37**
6886	Baugh & Sons Co., Norfolk, Va.	Baugh's Raw Bone Meal	Madison	D				3.84	4.66			[3]28.73
6833	Va.-Car. Chemical Co., Richmond, Va.	Pure Raw Bone Meal	Stoneville	D				4.24	5.15			[3]30.87
6898	do	do	Ararat	D				4.12	5.00			[4]29.09

[1]Total Phosphoric Acid found, 23.58, valued at 3½ cents per pound.
[2]Total Phosphoric Acid found, 21.30, valued at 3½ cents per pound.
[3]Total Phosphoric Acid found, 22.30, valued at 3½ cents per pound.
[4]Total Phosphoric Acid found, 23.38, valued at 3½ cents per pound.

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1908—CONTINUED.

Laboratory Number.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.						Relative Value per Ton at Factory.
					Available Phosphoric Acid.	Water-soluble Ammonia.	Organic Ammonia.	Total Nitrogen.	Equivalent to Ammonia.	Total Potash.	
RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming				**12.00**						**$ 9.60**
6885	Armour Fertilizer Works, Baltimore, Md.	Armour's Acid Phosphate	Tobaccoville	R	**10.12**						**8.10**
6870	Va.-Car. Chemical Co., Richmond, Va.	Old Dominion Royster Acid Phosphate.	Winston	R	15.11						12.08
	Brands claiming				**13.00**						**10.40**
6881	Va.-Car. Chemical Co., Richmond, Va.	A. & A.'s I X L Acid Phosphate	Durham	D	13.63						10.90
6896	----do	Norfolk-Carolina Chemical Co.'s Best Acid Phosphate.	Elkin	D	**12.45**						**9.96**
6868	----do	Old Dominion Bone Phosphate	Winston	R	14.79						11.83
6901	----do	Va.-Car. Chemical Co.'s Clipper Brand Acid Phosphate.	Elkin	R	13.37						10.69
6851	----do	Victor Acid Phosphate	Wilkesboro	D	16.92						13.54
	Brands claiming				**14.00**						**11.20**
6837	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	Winston	D	15.05						12.04
6852	Royster, F. S., Guano Co., Norfolk, Va.	Royster's 14 Per Cent Acid Phosphate.	----do	R	**12.60**						**10.08**
6891	Va.-Car. Chemical Co., Richmond, Va.	Almont High Grade Acid Phosphate.	Lincolnton	R	15.07						12.05
6869	----do	Old Dominion High Grade Acid Phosphate.	Winston	D	**13.66**						**10.92**
6835	----do	S. W. Travers & Co.'s Dissolved Bone Phosphate.	Stoneville	R	14.29						11.43
6882	----do	V. C. C. Co.'s 14 Per Cent Acid Phosphate.	Oxford	D	14.29						11.43
	Brands claiming				**16.00**						**12.80**
6861	Patapsco Guano Co., Baltimore, Md.	Florida Soluble Phosphate	Wilkesboro	R	**15.82**						**12.66**
6915	Richmond Guano Co., Richmond, Va.	Rex Dissolved Bone Phosphate	Dunn	R	16.27						13.02
6864	Royster, F. S., Guano Co., Norfolk, Va.	Royster's High Grade Acid Phosphate.	Winston	R	16.69						13.35
6865	Va.-Car. Chemical Co., Richmond, Va.	V.-C. C. Co.'s 16 Per Cent Acid Phosphate.	----do	R	16.16						12.93

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good: R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

II. ANALYSES OF COTTON-SEED MEAL.

Laboratory Number.	Name and Address of Manufacturer.	Where Sampled.	Per Cent Nitrogen Guaranteed.	Equivalent to Ammonia.	Per Cent Nitrogen Found.	Equivalent to Ammonia.
2309	Battleboro Oil Co., Battleboro, N. C.	Battleboro	------	------	6.69	8.12
2314	----do	----do	------	------	6.59	8.00
2321	----do	----do	------	------	6.57	7.98
2312	----do	----do	------	------	6.51	7.90
2326	----do	----do	------	------	6.42	7.80
2313	----do	----do	------	------	6.39	7.76
2380	----do	----do	------	------	6.29	7.64
2315	----do	----do	------	------	**5.77**	**7.00**
2338	Bragaw, Wm., & Co., Washington, N. C.	Washington	6.18	7.50	6.92	8.40
2362	Chatham Cotton Oil Co., Pittsboro, N. C.	Pittsboro	6.18	7.50	6.32	7.67
2363	----do	Sanford	6.18	7.50	6.74	8.18
2366	Consumers Cotton Oil Co., Tarboro, N. C.	Windsor	6.18	7.50	6.64	8.06
2367	Cotton Oil Ginning Co., Scotland Neck, N. C.	Palmyra	6.18	7.50	7.14	8.67
2343	Eastern Cotton Oil Co., Hertford, N. C.	Edenton	6.18	7.50	**6.11**	**7.42**
2340	----do	----do	6.18	7.50	6.34	7.70
2361	Elba Manufacturing Co., Charlotte, N. C.	Laurinburg	6.18	7.50	6.36	7.72
2358	----do	Charlotte	6.18	7.50	6.90	8.38
2303	Fremont Oil Mill Co., Fremont, N. C.	Edenton	------	------	6.59	8.00
2372	Georgia Cotton Oil Co., Atlanta, Ga.	Wadesboro	6.18	7.50	6.44	7.82
2336	Haven's Oil Mill, Washington, N. C.	Edenton	6.18	7.50	6.62	8.04
2297	Kings Mountain Cotton Oil Co., Kings Mt., N. C.	Kings Mountain	------	------	7.31	8.88
2368	Laurinburg Oil Co., Laurinburg, N. C.	Rockingham	6.18	7.50	6.76	8.21
2365	----do	Hamlet	6.18	7.50	6.56	7.96
2386	----do	Laurinburg	------	------	6.26	7.60
2289	----do	----do	------	------	**6.14**	**7.46**
2302	----do	----do	------	------	6.59	8.00
2290	Lenoir Oil and Ice Co., Kinston, N. C.	Kinston	------	------	6.74	8.18
2317	----do	----do	------	------	6.62	8.04
2304	----do	----do	------	------	6.56	7.96
2324	----do	----do	------	------	6.42	7.80
2323	----do	----do	------	------	6.39	7.76
2291	Morgan Oil and Fertilizer Co., Red Springs, N. C.	Red Springs	------	------	6.03	**7.32**
2337	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Edenton	6.18	7.50	6.65	8.08
2320	North Carolina Cotton Oil Co., Henderson, N. C.	Durham	6.18	7.50	**5.62**	**6.82**
2335	North Carolina Cotton Oil Co., Wilmington, N. C.	Chadbourn	6.18	7.50	**6.00**	**7.28**
2288	Pine Level Oil Mills Co., Pine Level, N. C.	Pine Level	------	------	6.23	7.56
2319	----do	----do	------	------	6.90	8.38
2341	Pitt County Oil Co., Winterville, N. C.	Greenville	6.18	7.50	6.29	7.64
2311	Rowland Oil and Fertilizer Co., Rowland, N. C.	Rowland	------	------	6.15	7.50
2357	Southern Cotton Oil Co., Charlotte, N. C.	Charlotte	6.18	7.50	6.46	7.84
2356	----do	Red Springs	6.18	7.50	6.04	**7.33**
2295	Southern Cotton Oil Co., Concord, N. C.	Greensboro	6.18	7.50	6.74	8.18
2369	Southern Cotton Oil Co., Goldsboro, N. C.	Lewiston	6.18	7.50	6.82	8.28
2339	Southern Cotton Oil Co., Rocky Mount, N. C.	Williamston	6.18	7.50	**6.01**	**7.30**
2344	Southern Cotton Oil Co., Tarboro, N. C.	Tarboro	6.18	7.50	**5.77**	**7.00**
2359	Southern Cotton Oil Co., Wilson, N. C.	Aulander	6.18	7.50	6.69	8.12
2361	Southern Cotton Oil Co., Wilmington, N. C.	Ahoskie	6.18	7.50	**6.14**	**7.45**
2331	Speed Milling Co., Speed, N. C.	Speed	------	------	6.62	8.04
2294	Statesville Oil and Fertilizer Co., Statesville, N. C.	Greensboro	6.18	7.50	6.84	8.30
2342	Tar River Oil Co., Tarboro, N. C.	Washington	6.18	7.50	6.90	8.38
2371	Virginia-Carolina Chemical Co., Richmond, Va.	Burlington	6.18	7.50	6.60	8.01
2325	Verner Oil Co., Lattimore, N. C.	Lattimore	------	------	6.98	8.38
2292	----do	----do	------	------	6.57	7.98
2318	Wells, J. Lindsay, & Co., Memphis, Tenn.	Hendersonville	------	------	7.08	8.60